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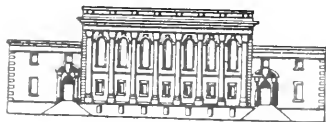
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ANIMAL DOMESTICATION:
AN ARCHEOLOGICAL INTERPRETATION

by

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ABSTRACT

Animal domestication is an ongoing relationship between man and animals characterized by the manipulation or control of the animals' behavior by man. The relationship exists in several forms, which are differentiated by the degree and particular manifestations of control exercised over the animals. Each form of domestication may be recognized archeologically on the basis of material manifestations of the particular form of control by which it is characterized. No form of domestication is unique to a given culture, economy, or period in sociocultural evolution. The relationship has occurred in each of its forms among vastly different cultures since ten thousand years ago, and appears to have occurred, in a relatively non-complex form as many as fifteen thousand years ago among Magdalenian reindeer herders in North Central France.

INTRODUCTION

This thesis represents an investigation into the nature of a relationship between man and his environment, and the exploration of the possibility of that relationships having occurred in a particular form as one adaptation of a human population to its habitat. To be investigated is the relationship in which man and animals are engaged in the process of domestication. Once the nature of this relationship and its various forms has been determined, it will be possible to outline its material manifestations, and to establish criteria by which each form of domestication may be recognized archeologically. Principles and criteria set forth in the first section will be applied in the second, in order to determine the possible existence of a rudimentary form of domestication in Upper Palaeolithic France.

It is not the purpose of the model to detail the economic and subsistence activities of a prehistoric people. Neither is it to pinpoint the origin of domestication. Both are quite unrealistic goals, and their pursuit would in any case, contribute little to this study. The model is constructed, rather, to relate certain theoretical ideas, in the form of a hypothesis, to observable facts. The relation of ideas to observations will be accomplished through a series of tests

based on criteria previously established. Verification of the original hypothesis through the formulation of the correct tests is the purpose of the model.

Validation of the model will re-emphasize the nature of domestication as a symbiotic relationship and will discredit the notion that domestication can be considered an event or invention associated with a particular stage in cultural evolution. Moreover, it will strengthen the suspicions of a growing number of anthropologists who imagine that the occurrence^{of} domestication, probably the single most important contributing factor in the Neolithic revolution, could have preceeded the revolution by thousands of years. The very suggestion that domestication could have been significant in the economic and subsistence patterns of human populations well before the Neolithic is a revolutionary one. It reflects an understanding of the nature of domestication different from all previous impressions, and exposes potentialities for research in areas yet unexplored. The realization of one of those immense potentialities constitutes the significance of this thesis. Archeological material, thought to have reflected a hunting subsistence economy in the Upper Paleolithic Paris Basin will be re-examined and tested with a different understanding. The findings may be revolutionary.

In preparation for the model, the first chapter will consider some existing theories of the nature and origin of domestication. The second will introduce the establishment and employment of selected criteria which can aid in the recognition of domestication from archeological evidence. Description of the several forms of domesti-

cation, and the means of identifying them archeologically will be discussed in the third chapter, and the model will be the subject of the last.

CHAPTER ONE

DOMESTICATION: DEFINITION AND ESSENTIAL CHARACTERISTICS

The body of literature dealing in one way or another with animal domestication is enormous. In this chapter, a sampling of existing theories concerning the nature and origins of domestication will be examined and criticized, the purpose being to establish a preliminary, workable definition, and to outline the essential characteristics of domestication. Definitions are suitable for listing distinguishing characteristics of objects, but must be used cautiously in the study of processes or relationships which may be extremely varied in form and function. They will be used here only in so far as they indicate the essential factors involved in, and characteristics associated with domestication.

On a very general, if not somewhat abstract, level domestication can be defined in terms of a "continuum or spectrum of symbiotic relationships between man on the one hand, and plants and animals on the other" (Smith 1966: 9). Domestication appears neither as a single event nor as a condition imposed on one species by another; but rather as an ongoing, mutually beneficial relationship between the two species. The relationship is further qualified by Bokönyí, who defines domesti-

cation as "man's special interference in the lives of certain animal species" (Bokönyi 1969: 211). It is man's special, or conscious, interference which makes animal domestication more than a simple symbiotic relationship. Watson notes that there is one factor in particular which distinguishes domestication from predation and other symbiotic relationships (Watson 1969: 69). That factor is control.

Students of domestication are in fair agreement that animal domestication is a relationship in which man has control over animals. Differences of opinion become apparent, however, when the attempt is made to specify the extent to which an animal's behavior must be controlled by man in order to classify the relationship as one involving domestication.

While Bokönyi is rather vague in defining domestication, he is quite specific in explaining what he calls the essence of it: "the capture and taming by man of animals of a species with particular behavioral characteristics, and their maintenance under controlled breeding conditions for profit" (Bokönyi 1969: 219). The nature and degree of control necessary to capture, tame, isolate, and selectively breed animals is so specialized that it could hardly be essential to all forms of domestication. As will be shown, the degree of control exercised by man over animals varies greatly, and in some cases in which domestication has occurred the animal's behavior is not obviously restricted. What Bokönyi outlined is not the essence of domestication, but rather the implications of it. It is of utmost importance in this study that the definition of domestication not be confused with its implications. While such activities as taming and breeding are often associated with

domestication, and indeed cannot be carried out in the absence of it, they are by no means essential to its existence. They have no place, therefore, in an objective definition. It is evident that domestication involves two major factors: the domesticator and the domesticate. Each must be considered not only as it interacts in a given relationship, i.e. domestication, but also as it existed outside of that relationship. In order to understand the animal's position in domestication, one must consider not only the domesticated animal, but also the animal in its wild state. Likewise, to appreciate man's role in domestication, one must consider his role as a predator as well as a domesticator. Man's involvement in domestication as other than a domesticator is denied by some, and ignored by most. This is unfortunate, as it is an extremely important point in a discussion of the nature of domestication, and is even more crucial to the archeological investigation of its simpler forms.

The particular way in which these factors are related in domestication is described as a process. As in any process, there must be an initial and a terminal form (although neither may be recognizable as such), and there must be at least one intermediate form. Development in processes is not necessarily from less to more complex, and any form may be considered to be situated at the beginning or the end, depending upon the point of reference. It is important to make the distinction here between "process" and "progress". "Process" describes development of natural phenomena; "progress" implies movement from one situation to another, more complex one. To date, no one has proven (although many have tried) that once domestication occurs, it steadily

evolves along a predictable path, approaching and passing successively more complex stages until it reaches the ultimate one. Conversely, it has been observed that within a given society, a relatively complex form of domestication can be succeeded by a less complex form (Binford 1972).

In many instances, man/animal relationships involving domestication do seem to have evolved from less to more complex. These relationships, as subsistence patterns, never exist in isolation from other culture patterns, and their development in any direction can usually be shown to be accompanied by development of other patterns in that same direction.

Domestication is, then, a process which is not characterized by a series of progressive stages. It is a relationship which can be realized in any of several forms. Each form is distinguished by the extent and nature of the control which man exercises over the animals.

Just when, where, and for what reason man began to control the behavior of animals is much debated. Of the theories which attempt to situate the beginnings of domestication in man's cultural history, the "stage" and "evolutionary" theories (as advanced most notably by Morgan) have been fairly well discredited. In those schemes, the various forms of domestication are identified with certain types of social organization which are arranged in order of complexity - the least complex being the earlier, and inferior form.

A similar orthogenetic theory put forth by Braidwood (1960) maintains that domestication occurred as the natural result of the steadily increasing cultural differentiation which began in the Early Mesolithic.

The ethnographer Sten Paterson (1956) suggests that the earliest forms of domestication appeared concomitantly with the sophistication of tool technology which began in the Upper Paleolithic. The reindeer is believed by Paterson to have been one of the first domesticates, having become domesticated as a sort of "hunting device". According to Lappish tradition, early reindeer hunters trapped their prey in pits and snares. They later learned to capture young animals with which they lured wild reindeer into traps. The young decoy animals constituted the beginnings of domestic herds.

Binford (1972) also believes that domestication occurred as part of, and in response to larger developments. Contrary to Paterson's belief that the occurrence of domestication represents more efficient exploitation of a particular resource, is Binford's which maintains that domestication occurred as a survival response to situations of stress characterized by disequilibrium between a population and available resources (Binford 1972: 436). In such situations, there would clearly be a selective advantage to any activity such as domestication which would increase the efficacy of subsistence technology.

Stress situations which would be likely to foster domestication could be caused by environmental changes. Childe (1951) contends that environmental change was indeed the probable cause of domestication. He writes:

"The conditions of incipient desiccation would provide the stimulus towards the adaption of a food-producing economy. Enforced concentration by the banks of streams and shrinking springs would entail an intensive search for means of nourishment. Animals and men would be herded together in cases that were becoming increasingly isolated desert tracts. Such enforced juxtaposition might promote that sort of symbiosis between man and beast implied by the word domestication (Childe 1951: 23-25)."

The symbiotic relationship between man and beast, once begun, would continue to evolve. The animals would remain near man's settlements, where they would find protection from predators, and food in the stubble of harvested crops (Childe 1936: 67-68). All the while, Childe explains, man would be familiarizing himself with the animals, and he would eventually begin to practice selective slaughter - eliminating the most untractable animals in order to create a more manageable herd.

Childe's theory is unusual among the earliest speculations as to the conditions under which the domestication of animals first occurred, in that it recognizes the symbiotic nature of the relationship. That domestication involves a symbiotic relationship is a very important observation, for it allows domestication to be considered a process, rather than an event or activity invented by man. It is doubtful, however, that Childe's impression of the development of the relationship to include first feeding, then selective slaughter of the animals, is a correct one. He is not alone in assuming that the feeding of animals is essential to their domestication. Erich Isaac is a chief proponent of the theory that animal domestication could only have occurred where there were settled agricultural communities, because of the food requirements of domestic animals.

Isaac points to the near East as the place in which the domestication of herd animals first occurred (Isaac 1970). It was in that region that most wild herd animals lived during the Upper Paleolithic and Mesolithic. It is known that from at least the Mesolithic, the human inhabitants of that area were sedentary farmers or pastoral

nomads. Complexes of the nomadic peoples often bordered on areas occupied by farmers who kept the same animal species which were known to the nomads. Isaac points out that in areas not adjacent to farming complexes, no form of pastoralism developed from hunting nomadism. In fact, he claims, hunters are incapable of recognizing and fully exploiting the potential of domesticable animals. Even if a domestic animal is given to hunting nomads, they will not become pastoral nomads. The bison hunting Indians of North America provide Isaac with the perfect illustration, for after the horse was introduced to them, they did not become pastoral nomads, but simply hunting nomads on horseback (Isaac 1970: 47).

That they are incapable of recognizing the potential for domestication is probably just as well for hunting peoples, for their economies and subsistence bases do not provide for the upkeep of animals. The vast stores of grain needed to feed domestic stock are possible only in agriculturally - based economies, and rather well developed ones, at that. Material proof that animals were first domesticated by agricultural peoples is to be found in all societies in which domestication exists. According to Isaac's analysis (and imagination), every style of harness and all techniques of animal handling are obvious carry-overs from pastoral societies (Isaac 1970).

The arguments suggesting that animal domestication began among incipient agriculturalists in the Near East are provocative, but not terribly convincing. Isaac and other proponents of the same idea base their argument on the knowledge of a relatively limited geographical area. That area is well documented in the archeological record, and it

seems fairly certain that the situation which they describe did indeed exist. It is quite possible that pastoral and hunting nomads lived in close association, but that only the pastoralists and hunters - turned - pastoralists were domesticators. Whether or not this situation existed proves little, however, about the origin of domestication elsewhere. The fact is that archeological evidence is mounting which suggests that the way in which domestication may have occurred in the Near East does not represent a pattern, and that it may have occurred in other parts of the world under very different circumstances.

The apparent refusal of some hunters to practice domestication and adapt a pastoral way of life when it is offered to them is not indicative of the incompatibility of hunting and domestication. Both hunting and domestication are means of subsistence. Domestication can also be a means of food production, as it insures adequate and readily available food reserves. Food production requires a certain amount of continued effort in order for it to be successful. Human groups are not naturally drawn to food production, and engage in it only if it offers a distinct improvement over the existing system. As long as one system adequately satisfies the basic needs of the group, and does not demand an amount of effort disproportionate to the amount of benefit received, that system is not likely to be discarded in favor of another one. Thus, although the bison-hunting Indians may well have recognized the potential for domestication, the prospect of changing from a successful hunting economy to a pastoral one may not have been an appealing one. Being shifting opportunists, as humans tend to be, they did employ the domestic horse in their existing system by using it to more efficiently exploit the bison.

Domestic animals, then, do not, in every case represent a mobile food supply. They may also be used as the plow and wheel are used - to exploit the environment as efficiently as possible. Whether and how they figure into a group's subsistence activities depends on two factors: cost and benefit. No one subsistence pattern necessarily precludes the domestication of animals.

The assumption that large stores of fodder are a necessary prerequisite for domestication reflects a misunderstanding of the concept of domestication. Dependence upon man for food and protection may follow domestication, but it is not a fundamental characteristic of it. Reindeer are domesticated in many areas of Scandinavia and Siberia, and yet are not dependent upon man but for occasional hand-outs. In fact, it has not been until recent times, and only in certain societies (the United States, for example) that large numbers of herd animals have become dependent on man for the bulk of their food. In such instances, the animals have been conditioned into dependency. Animals simply do not exist where there is insufficient food. If they are found in areas which cannot support them, then it is because man has put them there. To move animals from their natural habitats, or into unnatural concentrations and to keep them there is to exercise control over them. An animal so controlled is domesticated. It is not the way in which the animal is made to be dependent upon man, but rather the fact that its behavior is altered by man which makes it a domesticated animal. Therefore, vast stores of grain are necessary only if an already domesticated, that is, controlled, animal is to be kept outside of its natural environment.

One of the reasons Isaac places the origin of domestication in the Near East is because it is the natural territory of all domesticable herd animals (with the exception of the reindeer which Isaac claims was domesticated in imitation of other domesticates (Isaac 1970)). It must be assumed that it was necessary to feed the domesticated animals because they were either a.) kept in unnatural concentration, b.) fed a special diet in order to develop in a certain way, or c.) forced to remain in an area during seasons in which the natural food source diminished. In each case, the extra food would be needed to compensate for the animal's being forced into an unnatural situation. It is not the fact that the animal is fed which makes it a domesticate. It must be fed because it has been domesticated and forced to live in other than its natural environment.

It is interesting that archeologists and ethnographers such as Isaac, Laufer, and Hatt use the analysis of harness style as a sort of last ditch effort to prove the agricultural origins of animal domestication. In essence, they hope to convince that the "striking" similarity between harnesses used by reindeer drivers and incipient farmers is explained by the diffusion of those styles from the pastoral societies in which domestication and all associated paraphernalia originated, to the hunting societies which imitated the practices of the pastoralists. There is indeed similarity in harness style, but it is more logically the result of parallel evolution than diffusion of culture traits.

If an object is to be pulled by an animal, then the animal's energy must be transferred to it. Usually, loads pulled or carried by animals are too heavy or cumbersome for men to handle. Were men able to handle

a load easily, they would not go to the considerable trouble of harnessing an animal for the task. It is to the man's advantage to harness the animal in such a way as to allow for the most efficient transfer of energy from the animal to the object. In all draft animals, the "pulling power" originates in the thoracic or shoulder region. It is not surprising that pulling harnesses consist of a horizontal piece of wood, leather, or other strong material, placed across the chest or neck, and at least one piece connecting that part of the animal with the object pulled. All harness styles are variations of this one theme.

Likewise, similarity of milking methods and other animal handling techniques does not necessarily indicate a common origin. There are just so many ways in which an animal can be milked efficiently. There can be only limited variation, too, in the ways animals are branded, castrated, or hobbled. Such techniques evolved similarly within different cultures as responses to similar demands.

Analysis of the evolution of handling techniques is only used to illustrate or confirm the notion that the domestication of animals first occurred in Near Eastern pastoral societies. The theory that it must have begun in an area where agriculture was known is based on other ideas which emphasize the importance of animal keeping. That particular form of domestication, which is believed by some to have been the original, could not have occurred before the Mesolithic, by which time the economy and settlement patterns could support and profit from the upkeep of domestic animals. On the other hand, it is hypothesized that domestication occurred much earlier in some instances, as part of the natural development of hunting economies. It could have

occurred in any area where hunting was the principal means of subsistence, and during any time period, providing that the economy and technology were sufficiently developed.

Both of these theories assume that the reason for domestication wherever and whenever it first occurred was economic. Economic motivation seems likely, although there are interesting arguments to the contrary. Edward Hahn suspects that in some places where domestication has occurred, the economic motivation was not strong enough to outweigh the difficulty in domestication of certain wild animals. Cattle, for instance, must have been extremely difficult to domesticate. Wild adults were too hard to capture, and probably wouldn't have reproduced in captivity for some time, and the young needed large quantities of milk which primitive man had no way of supplying. There must, therefore, have been some reason why he would expend the effort to domesticate cattle and forfeit the rewards usually associated with domestication. Hahn suggests that primitive man was motivated by religion. Animals were domesticated, perhaps, so that they could be bred for certain qualities (color, shape of horn, etc.) which were of religious significance (Hahn, in Paterson 1956: 105).

Religion is a source of powerful motivation for man, it is true, but except in certain monastic communities, it is not as strong as the desire to protect or improve a food source. Furthermore, controlled breeding for the reproduction of specific traits is a characteristic of animal husbandry, which can occur only after domestication. Controlled fertility and supervised breeding are made possible by domestication; they are not prerequisites for its existence.

Paterson notes that in the study of domestication, it is as important to understand the human psychology as it is to recognize the dispositions of animals. He relates the Lappish belief that after reindeer hunting groups had occupied an area for some time, they began to regard that territory and the animals within it as their own. As the men took an increased interest in the welfare of the herd, the animals grew accustomed to them, and allowed themselves to be easily approached. There is no doubt that "domestication may have been furthered by instincts which make us cherish our own infants and are aroused by young animals [in our care] (Paterson 1956: 104)", but man's psychological adaptability to domestication is not in itself sufficient explanation for its appearance.

It is my contention that animal domestication is one form of exploitation which figures more or less importantly in some subsistence patterns. It occurs when man and groups of animals enter into a relationship which is such that man has some control over the animals' behavior. Domestication does not occur naturally at any given point in cultural evolution; nor is its origin associated exclusively with any particular subsistence pattern. Domestication is a process which can begin only in the presence of certain conditions, although not all of the conditions need be present for domestication to be imitated.

In order for domestication to occur, domesticable animals must be present in the behavioral environment. Man, the potential domesticator, must occupy the animal's biotope on at least a temporary or seasonal basis; settlements being of no fewer than several weeks duration (Butzer 1971: 404). It should be noted that since most herd animals

are migratory; their domestication may be accomplished only by human groups whose settlements are of no more than several months duration. Watson and Watson support the belief that potential domesticators must have at least a semi-permanent way of life on the grounds that "people who are constantly on the move do not have time to experiment with domestication (Watson and Watson 1969: 94)". By this it is implied that domestication can occur only through lengthy experimentation. This is unsubstantiated. The maintenance of domesticates requires a certain amount of concentrated effort on the domesticator's part, and it results in a change in his larger subsistence pattern. Now, if the pre-domesticator (meaning the potential domesticator who actually becomes a domesticator) has the time to experiment with domestication, then he must already enjoy a fairly successful means of subsistence. It is unlikely then, that he would risk experimenting with another one.

Furthermore, domestication need not be so time consuming. Corraling, harnessing, and taming are time consuming activities, but again, are not essential to domestication. In a following chapter I will discuss the suggestion that certain man/animal relationships could be such that domestication would occur almost automatically, with minimal effort and alteration of subsistence pattern. For now it is necessary that a working description of domestication be established, so that it may be identified from archeological evidence.

From the preceding discussion, it may be concluded that:

- Animal domestication is a continuum of relationships between man and animals in which man has some control over the animals' behavior.
- The process of animal domestication involves elemental man as a predator

and predomesticator, man as a domesticator, the animal in its wild state, and the domesticator.

- The particular way in which man manipulates or controls the animals' behavior characterizes the form which the relationship takes; the various forms of domestication are not necessarily successive.
- Pre domesticators and pre domesticates share a biome for a significant part of the year during which the animals figure in man's behavioral environment.
- The nature of man's interest in his domesticates and degree of control which he exercises over them may result in his dependence upon them, or theirs upon him, or in morphological changes in humans or animals.

CHAPTER TWO

THE RECOGNITION OF DOMESTICATION IN THE ARCHEOLOGICAL RECORD

As many other major subsistence activities, the practice of animal domestication can be recognized archeologically. Unlike fishing or hunting however, which can be shown to have been practiced by the existence of a single bit of incontrovertible evidence (such as a fishhook or bone point found in association with prey), domestication can not be (justifiably) claimed except on the basis of several criteria, and in some instances, its occurrence may not be proven beyond a reasonable doubt. The existence of domestication is difficult to prove because domestication is not a single activity; it is a relationship which involves many activities. Although those activities cannot be performed in the absence of domestication, the proof of its occurrence must not be dependent upon the evidence for related activities. As will be shown in this chapter, activities which are part of some subsistence patterns built around the complex forms of domestication are often erroneously considered to be requirements for any sort of domestication.

Berry, for example, cautions that domestication should be claimed only if there is evidence of morphological changes in the domesticates (Berry 1969). Phenotypical characteristics may indeed be evident in the

domesticated forms of some species, and absent in wild or earlier forms. If they are, they probably serve as a reliable indication that domestication has occurred. Two points must be remembered, however: Firstly, although genotypic frequencies may be altered in the process of domestication, genotypes themselves are rarely affected. Certain pathological conditions may be favored, and existing characteristics selected, but new ones are not usually produced. Furthermore, those phenotypes which are selected may exist in wild populations as well as domesticated ones, (although in fewer number). Secondly, morphological changes which occur rapidly in a large proportion of a population are results of, and attest to the control and manipulation of the population by man.¹ In other words, any impact on the physiology of the animal must be antedated by cultural domestication (Isaac 1970: 21).

The emphasis placed on morphological changes as criteria for domestication by Bokonyi is exaggerated. Such emphasis is usually unjustified, and it tends to discourage consideration of other equally important changes which occur in the process of domestication. The transition of man from predator to domesticator is often ignored. Evidence of that transition is no less present in the archeological record, but it is less obvious to some (Bokonyi, Berry) and considered too risky to try to interpret by others (Isaac, Berry). One might expect zoologists to show the greater interest in transitions in non human

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Such changes may of course be caused in wild populations by selection pressures originating in the environment, but tend to develop over a much longer period of time than those exercised by man in a controlled environment. The latter are what is being referred to here.

species, whereas anthropologists would be expected, in their study of domestication, to search for an understanding of changes in man and his culture. Ironically, most anthropologists - particularly archeologists - who have written on the subject have chosen to emphasize domestication's effects on domesticates, and have taken for granted its effects on domesticators. Doing so has resulted in a general lack of understanding of the nature of domestication and a lack of appreciation of its consequences.

Bokönyi's criteria for the recognition of domestication reflect to some degree that very misunderstanding. He writes that generally, there is evidence of domestication on a site if: a.) The proportion of age groups of a domesticable species is not the same as found normally in a wild population. b.) The proportion of the sexes of a domesticable species is not the same as found normally in a wild population. c.) Species known to have been domesticated and without wild relatives in that region appear. d.) Morphological changes appear in the domesticated animals. e.) There are any artistic representations of domesticated animals, or any artifacts associated with animal husbandry (Bokönyi 1969:220).

What Bokönyi does not make clear is that none of the above criteria, used alone, is sufficient to prove the existence of domestication in every case. Obviously domestication has occurred if there are artistic representations of practices associated with animal husbandry, but domestication may, and does occur in forms which do not include such practices. Similarly, morphological changes may not accompany domestication at all or may result from other selection pressures.

Used with other evidence Bokönyi's criteria provide for the recog-

nition of domestication if morphological changes in the domesticates are not present, which is a step in the right direction. Artistic representations and such cultural evidence can indicate domestication provided that they are interpreted correctly. Not all drawings of animals are of domestic ones. To indicate domestication, an artistic representation would have to show clearly the restraint or feeding of an animal. The representation of animals which are (or were) real but do (or did) not normally occur in the area may indicate that the animal was an imported domesticate. Mobiliary art, it must be remembered, does not necessarily originate where it is found, and may depict situations which did not occur there.

Differences in the age and sex ratios of suspected domestic populations and wild ones of the same species are good indications of domestication, provided that they, too, are used with caution. In general, animals killed by hunters are killed without regard to sex or age (Ducos 1969). Hunters kill those animals which are the easiest to kill - the very old, infirm, injured, ailing, or very young individuals. The proportions of sex and age of animals killed by hunters should be the same as those in the herd, or wild population. One of the characteristics of domestication is that it affords control and makes it possible to check with some precision the animal to be killed. It is in the domesticator's interest to leave in the herd those animals most important to the preservation of a healthy herd, and to eliminate only the less essential animals. One should, therefore, expect to find a.) more males than females, b.) more immature than adult individuals, and c.) more immature males than any other single group represented by the remains of slaughtered domestic animals. This has, in fact, been

found to be the case at several sites-among them Stellmoor (Sturdy 1975) and Molino Cassarotto (Jarman 1975).

Simple forms of domestication have been claimed on the basis age/sex discrepancies when there is no other positive evidence. The study of age and sex ratios has led Jarman (1975) to believe that a simple form of reindeer domestication existed at a MolinoCassarotto, a Neolithic site in Northern Italy. Remains of males far out number those of females, and seventy-five percent of the total kill is comprised of animals fewer than three years old. There is no evidence that the animals were confined, fed, or exploited as anything other than a food source, but the tunnel valley location of the site would certainly not preclude more elaborate control and exploitation.

It appears likely that domestication did occur at Molino Cassarotto, but Collier and White (1976) and Jéquier (1963) point at several faults inherent in age/sex ratio analysis. As employed by Jarman, it assumes two things: a.) that the population structure of the animal groups is stable within each group, and through time, and b.) that all predators always kill a representative sample of the population. Collier and White note in reference to the first point that the structure of ungulate populations is highly variable. Fluctuations in the number of males, females, young, and old occur seasonally. Caribou (Rangifer tarandus) populations may include seven percent juveniles during the early spring, or as much as fifty percent after the calving season in June (Collier and White 1975). Caribou are divided into several groups during most of the year, forming the herd only during periods of migration. Males and females are not equally represented in the smaller groups, most of which are exclusively female. Males associate with

one another only during the mating season when they engage in battle, and during migrations. Except for these periods they prefer to wander alone. Even within the larger collective, or the herd, the ratio of males to females can range from 9:100 to 132:100 (Collier and White 1975).

Delimitation of population structures of game animals is highly speculative. It is particularly so with regard to migratory animals, whose social organization varies drastically with seasonal changes. The natural ratios of age and sex against which bone remains are compared will be different for each season. Before making any comparison, the archeologist must first establish the season during which the site was occupied. Comparison could then be made with the speculated structure of the species population during the same season. Still, as Jarman points out (Jarman 1972:132) there is no way to account for the chance exploitation of either "male" or "female" territories.

Jéquier (1965) questions the reliability of age/sex ratio analysis by suggesting that the equal vulnerability of all animals in a herd is not a valid assumption. Male red deer, for instance, are less timid than females, and consequently fall prey to hunters more easily. It could be argued, too, that females would be more vulnerable because they stay in fairly close groups, and timid animals are always easier to approach when in groups. Furthermore, females tend to be more curious than males, a factor which might increase their vulnerability. Individual and group personalities of the sexes vary widely, and must be considered in the analysis of exploitation patterns.

Finally, Collier and White question the random nature of predation.

There is no law, they point out, which states that all predators must kill without regard whatsoever to sex, size or other characteristics. It is well known that given the choice, some hunters prefer certain animals to others. Greenland Eskimos who use caribou hides for clothing will kill individuals according to their size. American Plains Indians preferred the meat and hides of female bison, and so killed more of them than males whenever possible. Non-human predators are not believed to have any such preferences; they kill whatever they can - the very young, very old, or infirm animals.

Evidence that more animals of one size or sex were killed than another indicates that the exploitation of the species was selective. Conscious selection of animals to be killed is the most important characteristic of specialized hunting. It is also a characteristic of domestication. It is, however positive evidence only of specialized hunting. The selection practiced by domesticators is of a different nature than that practiced by hunters. Whereas hunters select individuals which exhibit desired characteristics; domesticators kill those animals whose absence would have a desired effect on the herd. Hunters are interested in the fulfillment of their immediate needs, and take no special measures to condition the herd for further exploitation, as domesticators do. Their conditioning need not involve selective breeding, diet supervision, or physical conditioning. People who practice simple, or even incipient domestication cull superfluous males, and avoid killing mature, healthy females. If the herd faces a harsh winter or difficult migration, the killing which is to be done may be done just before, to insure the survival of the herd. Evidence from Stellmoor, a Neolithic site in Bavaria, suggests that reindeer were

slaughtered in the autumn, before the herd retreated into the forests (Sturdy 1975).

Selective killing of animals by domesticators reflects their interest in the welfare of the herd. If the purpose of selective killing can be determined from ^{the} archeological record, domestication may be inferred. Unless the selection was practiced in the interest of the entire herd, it may indicate no more than specialized hunting. The analysis of age and sex ratios, then, does not offer proof of the existence of domestication. At best it suggests the existence of certain aspects of man/animal relationships which can be considered characteristic of domestication.

Another attempt to outline the criteria for domestication has been made by Isaac (1970) who suggests that an animal be considered fully domestic if it can be shown that:

- . It is valued and there are clear purposes for which it is kept.
- . Its breeding is subject to human control.
- . Its survival depends, whether voluntarily or not, on man.
- . Its behavior (i.e. psychology) is changed in domestication.
- . Morphological characteristics have appeared in the individuals of the domestic species which occur rarely, if ever, in the wild.

Animals which meet some, but not all of the above criteria are described as "semidomestic" (Isaac 1970:20)

Isaac's criteria reflect his appreciation of the complexity of the process of domestication. He realizes that morphological changes are not the only proof of domestication and that behavioral changes are equal evidence of it. He is, however, unspecific about the nature of the behavioral changes which accompany domestication, and even less

clear about how those changes are supposed to be seen in archeological evidence.

If the first point could be proven, that an animal is valued and kept, then it would represent an "after the fact" proof of the occurrence of domestication. An animal must be valued in some way, or it would not be domesticated, and it must be domesticated before it is kept. The way in which the animal is valued and kept is often difficult to determine from archeological evidence. Burials, paintings, and mobiliary art may suggest the animal's significance in ritual. Evidence of the use of animal products is also indicative of its value and the reason it is kept. Pueblo-dwelling Indians of the Southwest kept a bald eagle feathered to a post as a permanent supply of feathers which were used in rituals and awards ceremonies. A single such eagle, although obviously valued and kept, could hardly be proof of the domestication of eagles. Domestication involves the value and keeping of animals in such quantities as are significant in the economic or subsistence patterns of the societies keeping them.

Isaac's second and third criteria also are after the fact proofs of domestication. Selective breeding is made possible with the control and manipulation characteristic of domestication, and it is practised only in relatively complex forms of domestication. Animal dependency on man may also be a result of strict control and manipulation, but it does not occur in most forms of domestication. Dependency and husbandry may not occur unless domestication has already taken place, and never occur at all except in the most complex forms of domestication. Their evidence is positive proof that domestication did occur,

but lack of their evidence is no proof that it did not.

Establishing both valid and justifiable criteria by which the archeologist can determine the existence of domestication is difficult. Most of the difficulty stems from a basic misunderstanding of the nature of domestication and the confusion of its possible effects with essential attributes. Domestication is a process which takes several forms, each representing a somewhat different relationship between several factors. Therefore, the recognition of it must be based on different sets of criteria. No one set of criteria can identify all forms of domestication. It is necessary for the archeologist to first distinguish the various forms which the relationship can take and characterize each form in terms of the degree and nature of control exercised. He then must decide how the control might be manifested and reflected in the archeological record. For instance, if a certain form of domestication were considered to exist wherever animals are penned in areas much smaller than their natural grazing areas, then the archeologist would look for evidence of enclosures, which may be suggested by natural boundries (rivers, cliffs, etc.), man-made boundaries (post holes, trenches) or areas of abnormally high concentration of animal dung. If another form of domestication were characterized by the frequent practice of castration, then it would be indicated by the presence of castrates. The archeologist attempting to prove the existence of the latter form need not feel his case lost if there is no evidence that the animals were kept in enclosures.

The distinction of the different forms of domestication is, then, an important first step, for a situation which is undefined cannot rightly be claimed to exist.

CHAPTER THREE

FORMS OF DOMESTICATION

PRE DOMESTICATION

Incipient domestication is the least complex form of domestication. It may be copied by one group from another who practice it,¹ although it is generally considered to have evolved from hunting (Zeuner 1956, Hatt 1919, Watson and Watson 1969) and a situation I will refer to as "pre domestication." Pre domestication describes a relationship in which man interferes in the lives of certain animal species as a predator. The animals must be amenable to domestication, the human community must have at least a semi-sedentary way of life, and they must have a socioeconomic system which would permit and profit from the domestication of animals.

Essentially no more than advanced specialized hunting, pre domestication describes the situation which may have occurred just prior to the earliest form of domestication, and for that reason, can only be recognized in the past tense. It would be impossible to (justifiably) claim pre domestication from a archeological evidence. Never-

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Laufer maintains that the Jokkmokk Lapplanders domesticated reindeer in imitation of cattle domestication which occurred further South (Laufer 1917).

the_ less, it is necessary to recognize the presence of this stage in order to realize the significance of the transition in man's relationship with the environment which occurs with domestication. Before the transition can be seen, of course, the previous situation must be understood.

All subsistence activities, including hunting and those associated with domestication, exist in a dynamic relationship between man and the environment. Identification of that relationship depends upon the identification of the elements involved, the human group, and the environment. As Davidson (1973) notes, identification of the environment must include consideration of not only the biological, but also the perceived and behavioral environment. The biological environment consists of all physical features and living organisms and contains within it the perceived and behavioral environments. The perceived environment consists of images or ideas of the biological environment which are held by human inhabitants, and which are used in their decision-making processes. The actual, or behavioral environment consists of those elements of the perceived environment which elicit behavioral response by humans (Davidson 1973). Those parts of the total environment which are in regular or cyclical articulation within the unit studied are referred to by Alec (1949:1) as the "effective environment".

Analysis of relationships between any elements within the environment is impossible without proper environmental reconstruction. Reconstruction of the biological environment is done through floral, faunal and geologic analysis. Its accuracy is determined by the accuracy of sampling and dating methods. Reconstruction of the perceived environment

is somewhat more speculative. It is generally safe to assume that it consists of all elements which the human inhabitants, given their supposed level of technological development, are likely to see. Microscopic particles are part of all biological environments, but exist in the perceived environment of very few. Similarly, the way in which a part of the biological environment is perceived depends upon the group's technological development and experience of other environments. The vast plains of North America were seen by the Comanches as grazing land, whereas the white settlers saw them as potentially productive farmland.

It must not be assumed that all environments appear the same to all human cultures, nor may it be assumed that every culture will exploit like environments in like manner. The Navaho and Pueblo Indians are neighbors in part of the southwestern desert in New Mexico and Arizona. Hoebel writes that:

Both tribes practice gardening and pastoralism, and yet their utilization of the environment and their social systems are very different. The Pueblo Indians...live in compact masonry villages. Most of their villages have remained stationary for centuries. They garden with intensive proficiency and exhibit more interest in religious and ceremonial control of weather and crop fertility than they do in the mechanics of gardening itself...The Navahos, on the other hand, live in widely dispersed hogans, and their main interest is fixed upon sheep. They also garden, but in only a minor way. They do virtually nothing about weather control or crop fertility...Navahos and Pueblos in personality, lifestyles, and social organization, are as unlike as night and day, despite their identical physical environment (Hoebel 1972:249).

Given only the fact of the existence of the Navaho and Pueblo Indians in a certain environment, one could not predict the nature of their exploitation of available resources. More information would be needed to reconstruct the perceived and behavioral environments of each

group. "It is essential that the environment and ecological setting of cultures...be established as accurately as possible, for, without this knowledge, we can hardly begin to interpret the cultural evidence (J. D. Clark 1960: 308)." In the model which follows, we will attempt to reconstruct (as accurately as possible) a.) the biological environment, in order to determine which elements could possibly have been significant in the ecology of the human inhabitants, b.) the perceived environment to know which elements were indeed important, and c.) the behavioral environment to understand how those elements were involved in particular relationships with man.

When man controls another living species within his behavioral environment, he domesticates it. Domestication may be said to occur if a minimum of control is exercised. Minimal control characterizes "incipient domestication", which is discussed at some length in Chapters II and IV. At this point, it would be well to deal with a slightly more complex relationship between man and the behavioral environment: simple domestication.

SIMPLE DOMESTICATION

Simple domestication will be considered here to be a relationship in which man consciously exercises control over the behavior of certain animals. Control may be exercised over one or several aspects of the animals' behavior, including temperament, grazing and migration patterns, or breeding activities.

The reindeer economy of the Samoyed is based on a man/animal relationship involving simple domestication. The Samoyed are reindeer followers, and to some extent herders, who occupy the marshy tundra in western Siberia (Forde 1963). Their herds are exploited as sources of food (meat and blood), clothing, shelter, and all manner of household articles, tools, and utensils. In addition, the reindeer are employed occasionally as draft or pack animals (Donner 1959). Most of the herd is allowed to roam freely, under only light supervision, except those males used as pack or draft animals, which are castrated and kept near the base camp. Also kept nearby, but used neither for meat nor transportation are a certain number of holy reindeer. Unfortunately, Donner does not elaborate on the particular functions of these animals.²

The Samoyed slaughter animals as they are needed for food, but try to restrict most slaughtering to the autumn. Donner (1959) gives two reasons for the restriction: conservation of the scarce winter food supply for the healthiest fertile animals, and preservation (by freezing) of butchered meat during the following months. Reindeer are killed indi-

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It is interesting, although not all surprising, that a culture so heavily dependent on one resource would include some representation of that resource in their religion. There is no reason to doubt that pre-historic herders could have done the same.

vidually, a practice which may seem unusual since seasonal slaughters are more frequently carried out in a round-up fashion. The Samoyed kill by strangulation, so as not to damage the valuable hides. This requires that each animal be singled out, approached by men (sometimes using decoys), and strangled until it dies - a process impossible to repeat if other reindeer are confined in the same area. It is due to the comparatively close association the animals have with man in this form of domestication that the animals tend to become habituated to man's presence - and are, therefore, more easily approached and strangled.

The relationship which exists between the Samoyed and their reindeer is characterized as one involving some control over several aspects of the animals' behavior. While the herd's movements are monitored, their behavior as a group is little changed, except for a general habituation to man's constant presence. The temperament, mobility, and breeding of some animals (those used for transportation) is noticeably altered by simple domestication as practiced by the Samoyed. Those animals constitute an economically significant number in Samoyed herds; Forde claims, in fact, that Samoyed reindeer are pre-eminently draft animals, and that their herding is of little direct significance in the Samoyed's food supply (Forde 1963: 363). His opinion is not shared by others (Laufer 1917, Hatt 1919, Donner 1959) who believe that while the reindeer is understandably important as a draft animal during migratory treks it is of greatest value as a source of food. The Samoyed economy then, is based on the availability of reindeer for food, clothing, housing, and transportation, and their availability is assured by simple domestication.

Simple domestication may be indicated in the archeological record by:

- a.) artistic representations of restrained animals
- b.) implements or structures used to control and restrain
- c.) abnormally high percentage of castrates
- d.) selective slaughter
- e.) evidence of animals existing in an area or during a season during which they do not normally occur

Artistic representations may suggest the occurrence of domestication provided that they can be shown to belong to the same culture which is suspected to have domesticated, and to the same time period during which domestication was supposed to have occurred. Also, to be a valid indication, the art must depict or represent an economically significant number of animals. Otherwise, it may represent no more than a few rare, holy, or even imaginary subjects.

Implements and structures used to ~~control~~ ^{restrain} or restrict would, of course, include any sort of harness, coral, fence, or natural enclosures such as tunnel valleys, parabolic dunes, and islands. Percentage of castrates and evidence of selective killing are good (and frequently the only) indications of the less complex forms of domestication, but must be considered with caution, as discussed in the preceding chapter. Also as discussed earlier, evidence of a particular species' existence in an area or during a season in which it does not normally occur is suggestive of domestication.

These criteria are suggested for the archeological recognition of simple domestication because they reflect the various manifestations of the control relationship which characterizes it. It is a relationship which allows a comparatively efficient and varied exploitation of animals by man, without necessitating or resulting in the complete dependence of one upon the other.

ADVANCED ANIMAL MANAGEMENT

Advanced animal management involves the control of animals' behavior through the control of food supply, living area, or breeding. It is characterized by the increasing dependence of man and animals upon one another for food and protection. This form of domestication is distinct from, although may include animal husbandry, which is characterized by the practice of selective breeding for specific qualities.

By this definition, the form of domestication practiced by the Jokkmokk Laplanders is one which involves advanced animal management. Seminomadic herders, the Jokkmokk Mountain Lapps practice what Paterson terms "intensive" and "extensive" reindeer "breeding". Paterson makes no mention of specific breeding activities, however, other sources (Laufer 1917, Hatt 1919) claim that Lapps engage in selective breeding only in a very minor way, if at all. It is Hatt's impression that the Lapps do not breed their animals for desired qualities, but control the fertility of some (i.e. castrate, prevent mating) to keep order in confined groups during mating season, or to use them for other purposes. Paterson appears, then, to be another victim of the confusion of husbandry with domestication. In all probability, he is using "breeding" as a synonym for "domestication". To avoid perpetuating this confusion, the word "domestication" will be used here unless a specific process of selective animal breeding is being referred to.

Intensive reindeer domestication "may be looked upon as the most advanced form of reindeer care. It is characterized by strict guarding of the reindeer herd throughout the year, which was a necessary as-

sumption so that the herd during the summer months might be driven together once or twice daily in order to be milked (Paterson 1956: 28)." Although it involves some, extensive domestication it does not depend on careful tending and regular milking, which are prominent features of the intensive form (Paterson 1956).

Intensive domestication characterized the Lappish subsistence pattern until the end of the last century, when the introduction of industrial products made the very close association with and strong dependence upon reindeer less necessary. It still is practiced to some degree, however, along with the extensive form.

The form of domestication practiced today by the Jokkmokk Lapps permits exploitation of the herd for food (meat and milk), some clothing, and various household articles. This is achieved through a close relationship with the animals which are kept near the camp, sometimes penned and fed, and supervised whenever allowed to graze further away. Reindeer are also frequently used as pack and draft animals by Lapps, and are castrated for this purpose.

Close association with man has resulted, in this case, in the animals' increasing dependence upon man for food and protection from wolves, against which reindeer are practically defenseless. While they are by no means totally dependent on man, the animals are fully habituated to his presence, and are content to remain near his settlements. In the sense that they become hesitant to stray far from camp (whether they would be allowed to or not), they have become dependent upon man. Their temperament has thus been changed by the process of domestication.

The Nuer of East Africa practice a similar form of domestication, but theirs is one in which selective breeding plays a more important role. Nuer are cattle tenders who practice husbandry (Evans-Pritchard 1940). During the dry season, they allow their cattle to graze with some supervision, but they confine the animals to covered byres during the rainy season. Cattle are not raised explicitly for meat, but the end of every beast is, in fact, the pot (Evan-Pritchard 1940:28). They are used primarily for milk and blood; their hide, bones, and horns are also used, but the animals are not killed for this.

Most male cattle are castrated. The Nuer do this to keep peace in the kraais, for uncastrated adult males cause a great deal of commotion when there are available females nearby, and tend to fight with each other constantly. One bull is generally kept to serve about forty females. Only bulls born of the best milk producing cows escape castration. By reserving as studs only offspring of the best milk cows, the Nuer practice selective breeding; the trait selected for being milk yield.

Both the Nuer and the Jokkmokk Lapps practice a form of domestication which involves control of the animals' food supply, living area, or fertility, resulting in control of their behavior. The Lapps exercise control over the grazing pattern of the herd, contribute to its food supply, and control the fertility of many individual animals. The Nuer control the living area and fertility of cattle, and also influence their breeding by selection of studs. The form of domestication practiced by both groups is defined here as advanced animal management.

Advanced animal management may be inferred from archeological evidence of several sorts:

- a.) presence of implements associated with animal management techniques.
- b.) evidence of confinement areas.
- c.) artistic representations of animal management techniques.
- d.) presence of castrates, in higher than normal percentage.
- e.) morphological changes in animals over time.
- f.) evidence of fodder storage

The similarity of the above list with Bokonyi's "criteria for animal domestication" (see page 18) should be apparent, and it is unnecessary to belabor the reasons for this. Now that these criteria are associated with their correct form of domestication, a few points should be clarified. "Implements associated with animal management techniques" would include harnesses, shackles, twitches, and other restrictive devices, as well as tools associated with their manufacture, and articles used in milking and bleeding. Areas in which animals are confined may be indicated by post hole perimeters, areas of unusual concentration of dung, or areas enclosed by natural boundaries such as canyons, tunnel valleys or islands. Artistic representations of management techniques would include renditions of milking procedure, confinement, harnessing, etc. It should, of course, be established that the number of animals affected is one of economic importance. Otherwise, what is represented in the art may be of religious significance (a caged bird, for example) and may not have been at all significant in the subsistence system.

Castrates, if present in significant number, may also indicate this form of domestication. Comparatively few castrates may indicate

no more than the use of certain animals as decoys, but a larger percentage³ would provide good reason to believe that fertility control was important to maintenance of the domestic population. Fertility control may or may not accompany selective breeding. The latter sometimes results in morphological changes, and if it can be proven that such changes could only occur as a result of purposeful selective breeding, then their presence would serve as an indication that husbandry, and, therefore, advanced animal management, was practiced.

If it can be established that the store of fodder was intended to supply the animal population with most of his nutritional requirements, then such evidence would suggest dependence upon man, which is one of the features of this form of domestication.

Advanced animal management as a form of domestication, provides for highly efficient exploitation of domestic animals. Animal husbandry allows the maximum exploitation of domestic animals, which includes providing for future generations through selective breeding. Determination of the occurrence of domestication with advanced animal management on the basis of archeological evidence must, as must any form of domestication, be done carefully, and never with reference to only a single criterion.

INCIPIENT DOMESTICATION

When early man first recognized the potential advantages in controlling certain elements of the environment, specifically, when he discovered the advantages in keeping animals near to his dwelling place,

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The percentage of castrates in the total male (domestic) population depends upon the reasons for which the animals are castrated, and is, therefore, impossible to estimate in a general sense.

he was entering into the first phase of domesticating them (Berry 1969:207). Isaac calls this transitional phase "incipient domestication" and considers it restricted in time to the Mesolithic (Isaac 1970:26)⁴ Incipient domestication will be considered here to describe a relationship in which man, primarily a hunter, not only interferes in the lives of certain animal species, but also exerts an influence on the behavior of groups within those species i.e. herds. That influence reflects man's interest in the animals' welfare and maintenance of the herd. It involves at least one of the following: a.) selective killing; b.) frequent contact between the animals and man, resulting in the animals' habituation to man; c.) protection of animals by man. Archeological evidence of selective killing would be found in the age/sex ratios of animal remains. As discussed at length in Chapter II, discrepancies in age/sex ratios of wild and suspected domestic populations are not necessarily proof of domestication, and their usefulness depends on a thorough familiarity with animal ecology. Frequent contact with and habituation to man may be reflected in slaughtering techniques, and in artistic representations. Art which depicts unteathered animals or an unpenned group of animals not resisting approach by man could be positive indication that the animals are domesticated.

The manner in which animals are killed by hunters generally seems to differ from the way in which they are slaughtered by domesticators. Individuals are killed by hunters in hiding with arrows, spears, or in traps or snares. Large animals are often brought down by groups of

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see page 6.

men hurling javelins, spears, stones and other projectiles at the animal which, if they do not serve to kill the animal, weaken it so that it may be approached and finished off by a single blow. One would expect that the bones of an animal killed in this way would bear traces of some of the projectile points. This is indeed what is found to be the case at the Lehner mammoth site in Southwest Arizona, where a single mammoth, believed to have been killed by hunters using stone pointed projectiles (Haury, E. W. and Sayles, W. W. 1959).

Individual animals are also killed by hunters using disguises. The Manchu take advantage of the male reindeer's instinct to battle other stags during the mating season. "(They) take a stag's head with the antlers, hollow it out, and place it over their own head. With a hidden decoy whistle, they imitate the call of a stag so perfectly that the animal is deceived. [The hunters] crouch in the thicket, and at the sound of the whistle, the stag comes out in the open for an attack (C. Visdelov, in Laufer 1917:134)." An animal lured thus into close range could be quickly dispatched with one or two well-placed spears. This technique of hunting is not distinguishable on the basis of archeological evidence from some methods of slaughter used by domesticators, except, of course, if it is illustrated artistically.

Larger animals are often killed en masse by hunters in stampedes and round-ups. The stampede, as practiced by bison-hunting Indians in southwestern North America and the Acheuleans of Torralba, Spain usually resulted in a supply of meat and other products far greater than what could be utilized within a reasonable period of time. At the Olsen-Chobbsuck site 190 bison were stampeded into an arroyo; 40 animals

were not butchered, and their skeletons lie intact under the heap of partially butchered animals (Wheat 1974:162). Indiscriminate and wasteful, this sort of mass killing is practiced by only those hunters who have no reason to concern themselves with the maintenance of a healthy herd. The roundup practiced by hunters has the same effect on herd populations as does the stampede. After one Cheyenne antelope hunt, during which the animals were chased down a v-shaped path into a circle of club-wielding hunters, a frontier trader observed that more than six hundred animals had been killed (Grinnell 1915:288). Stampede and round-up sites are easily identified from archeological evidence. They can be distinguished from domesticators' slaughter sites by the presence of intact skeletons.

Corralling practiced by domesticators differs from the Cheyenne type round-up. Its purpose is not to kill as many animals at once as possible, rather, to facilitate the convenient, efficient slaughter of selected animals. Thus, in the autumn Samoyed round-up, only as many selected animals as can be used are slaughtered (Donner 1959).

Similar to the hunters' use of disguise to attract prey individually, is the domesticator's use of decoy animals.

"Guided by a specially trained reindeer which he holds on long line, the Tungusian hunter approaches the pasture of wild reindeer, hides himself behind a bush or hillock, letting the trained reindeer go forward. The wild reindeer, on seeing the decoy, approach it, led on by the herd instinct; the hunter softly pulls the reindeer closer to himself, and the [wild] reindeer follow until they are within easy range (Hatt 1919:101)."

The Koryak use decoys in a particularly ingenious fashion:

"Having found the tracks of a herd of wild reindeer, the hunter lets one stag loose, after having tied a thong in several loops round its antlers..., taking the

sent of wild dams, [the decoy] runs to overtake them. The wild stag does not allow his adversary to approach the females, but engages in a single fight with him, and becomes entangled in the thong, whereupon the hunters rush in to kill him (Jochelson).

The difference between the use of disguises and the use of decoys is that the possession of live decoy animals makes the possessor a domesticator. Hatt (1919) believes that the use of decoys must have been characteristic of the initial stages of domestication. It is "highly probable," he writes, "that this hunting method - a decided improvement upon the hunter's older practice of disguising himself so as to look like the deer - was the first motive which brought about the domestication of the reindeer (Hatt 1919:104)." Whether or not the need for decoys caused the domestication of entire herds, it is certainly reason to domesticate and keep some animals. In addition to their domestic herd, the Samoyed keep a certain number of male reindeer, which they partially castrate, to use as decoys. It is possible that once the advantages of taming or training decoys were realized, larger scale domestication was undertaken.

The actual techniques of killing individual domesticated animals are varied. If the animal is lured by a decoy, or especially if it is fully habituated to man, then it may be easily approached and strangled, or killed with a knife plunged into the heart, back of the neck, or throat. Hatt notes that stabbing and clubbing antedate strangling and throat cutting, which require great skill at close range (Hatt 1919:104). It appears however, that the technique used depends on two things: the way in which the animal is to be used, and religious or magical beliefs surrounding the animal and its use. Thus

the Koryak and Samoyed strangle reindeer so as not to damage the hides which they use for clothing and shelter (Hatt 1919), and in many Jewish communities, animals are slaughtered by having their throats slit, according to religious prescription.

In any case, domesticators tend to use fewer weapons to kill each animal, and the weapons they do use are less likely to be of the type, like projectiles, which may strike bones or remain lodged in parts of the animal's body. One would expect, then, to find weapons or traces of them less frequently in association with domesticated animals than with hunted ones. Obviously, conditions of preservation and butchering techniques may prevent the observation of such associations, and must be taken into careful consideration by the archeologist.

Man's protection of animals, another characteristic of domestication, may be manifested in several ways. Removal of certain animals from the herd in order to conserve resources for the others is one way. Modern Lapps, for instance, cull in the autumn those reindeer which are not likely to survive the winter so that the vital winter grazing land may support the rest of the herd (Paterson 1956). A similar slaughter pattern is hypothesized for pre-Neolithic reindeer herders at Stellmoor (Sturdy, 1975:93). Protection from predators is another way in which domesticators assure their herd's maintenance. It is not unusual for herders to allow their animals to graze freely, interfering only if an animal strays too far from the others, becoming easy prey. Supervision of this sort is not verifiable from archeological evidence; there is no reason to doubt, however, that it could have occurred if herd populations were seriously affected by predation.

It is likewise not unreasonable to suggest that herders or herd followers could supplement the animals' food supply in case their natural source of food were depleted. The Jokkmokk Lapps, for instance, give salt-a necessary and craved nutrient-to their favored reindeer. Only an agricultural economy, of course, could support large numbers of animals during a serious food shortage.

The model which follows will illustrate how certain of the particular manifestations of control just discussed combined in the man/animal relationship which existed at Molino Cassarotto. The model will also serve to demonstrate how the features of that relationship might be seen archeologically.

MOLINO CASSAROTTO

Molino Cassarotto is a pre-Neolithic, seasonally occupied site in Northern Italy. It was occupied during the summer months by groups who depended heavily upon, and perhaps domesticated red deer (*C. elaphus*).

Jarman (1975) believes that it is reasonable to assume that much of Europe was occupied throughout the Postglacial by human populations who exploited continually the same deer populations. This arrangement must have been a mutually favorable one, as "it is not likely that so successful and so well-balanced a relationship could survive for such long periods if it were simply a case of a parasitic predator exploiting a prey population to the latter's detriment (Jarman 1975:131)."

In assessing the significance of mortality curves as indicative of a close man-animal relationship, Jarman notes the significance of certain features of red deer populations.

While more males than females are born, their mortality rate is higher, and consequently the ratio in the herd as a whole is low, females

outnumbering males, by as many as 2:1 (Jarman 1975:132). Except during the rutting season and periods of migration, adult males and females do not associate. Hinds and immature animals form rather large, compact groups. Adult males sometimes form loose groups, but more often wander solitarily. Individual and group personalities of the sexes vary considerably. Males are generally more aggressive, especially during the rut, and tend to behave less predictably than females, who organize themselves and move in relatively stable groups.

Unfortunately, the various cultural artifacts found at Molino Cassarotto offer no clues to the nature of the man-deer relationship. Determination of it may be made, in this case, only on the basis of age/sex analysis, which would reveal selection in hunting. It is hypothesized that if domestication occurred the proportions of age and sex of deer killed by the inhabitants of the site should be different from those in wild populations of the same species during the same season. Recalling the discussion on pages (22-23), one would expect the bone assemblage on the site to contain a.) more males than females, b.) more immature than adult individuals, and c.) more immature males than anything else.

Indeed, a much greater proportion of males is represented at the site than normally occurs, and immature animals (under 3 yrs. old) account for 75% of the total kill. Domestication is not, however, a foregone conclusion. There are at least two other possible explanations for the discrepancies. One is that males, being bold and aggressive, would have been more susceptible to hunters than the skittish female (Jéquier 1963). The other is that the discrepancy could be due to the

chance exploitation of a male territory.

In his criticism of the first alternate explanation, Jarman points out that because females are more timid, they keep in tight groups. All herd animals are more approachable when in groups than when grazing alone, and so females may actually be easier to hunt than males. Furthermore, hunting males would demand considerably more time and effort, since they are few and far between.

With regard to the second explanation, Jarman notes that although males and females rarely associate, their respective groups are separated more socially than geographically. In fact, male and female territories often overlap. Chance exploitation of one area or the other seems even less likely if one remembers that the exploitation territory of human subsistence economics is thought to be within a 5-10km radius of the site (Vita-Finzi and Higgs 1970), and that within that distance parts of both male and female territories could surely coexist.

The case for conscious selection at Molino Cassarotto is a good one. Similar selection patterns are indicated at Star Carr (Clark 1954) as well as Seeberg Burgäschisee-süd (Boessneck, Jéquier et. Stampfli 1963), and suggest that the pattern may have been widespread among European deer economies in the pre-Neolithic. The pattern was one which reflected human interest in maintenance of animal herds. By exploiting most heavily the non-breeding part of the herd, incipient domesticators were able to maintain a successful economic relationship without impairing herd viability (Jarman 1972:133).

The reindeer economy of the Chuckchi appears to be based on the same sort of relationship - incipient domestication - which existed at

Molin^o Cassarotto. The Chuckchi live a nomadic life on the remote, north-eastern peninsula of Asia. They practice reindeer herding in a rudimentary form, following the herds and exerting only minimal and infrequent controls on their movement (Forde 1963: 363). The herds are of value to the Chuckchi only in providing meat. While they are habituated to, and seem to enjoy man's presence,⁵ they are not tamed (Forde 1963: 363). They will not tolerate any sort of direct physical contact with man, and are, therefore, quite useless as milking or pack and draft animals. Not every herd in Chuckchi territory is domesticated; some are completely wild, but interact frequently with the domesticated ones, especially during the rut (Laufer 1917).

Wild reindeer are attracted by Chuckchi wearing disguises of hides, and also by human urine, for which the animals have an insatiable appetite. Odulok describes a scene which illustrates the effectiveness of urine in attracting wild reindeer:

"(The men) had spilled a little urine on to the snow from a flask they had been carrying, and had crouched out of sight, waiting for the leader of the band of reindeer. The leader, with a start, planted his feet firmly in the snow and licked it greedily. The other beasts, smelling the human urine, ran to the leader, hustling into a solid mass, and began to lick him and the place where the urine had been spilt. At the same moment, the men crept stealthily up to the herd. They dragged off a lean reindeer by the feet, seized it by the antlers, and stabbed it (Odulok 1934:17-19)."

It is highly probable that urine was used by hunters just as disguises were. In fact, there are hunters today who have recognized and capital-

5

Odulok (1934) describes Chuckchi reindeer as being uninhibited creatures, hesitant to stray too far from the herd, and not reluctant to approach the tents, sniffing about for something to eat.

ized on the reindeers peculiar tastes. The practice of using human urine as a means of bringing a wild animal into close range for killing may be limited neither to hunters nor domesticators, however, it may have suggested another use to potential domesticators, the adoption of which may have been crucial in permitting the transition from pre to incipient domestication. Human urine is purposely spilled around Samoyed and Chuckchi camps to entice reindeer to graze nearby, and to encourage the development of a close and regular association of the animals with man (Donner 1959). Whether the herders' original purpose in spilling urine around their camps was to foster a close association with the reindeer or simply to make it easier to find them, close association was inevitable, and habituation was the natural result of it. Both the Chuckchi and the Samoyed perpetuate the association and encourage habituation by giving urine to favored animals as a reward or special treat. The domestication, ie. habituation of some herds in Chuckchi territory to man's presence facilitates the slaughter of individuals within them. They can be approached fairly easily, caught in a lasso, and speared (Odulok 1934). Slaughter of domestic reindeer is considerably simpler for the Chuckchi than hunting wild ones. Hunting is practiced only to conserve the domestic population (Laufer 1917).

The point here is that animal behavior can be variously affected by the different employment of one technique by hunters and domesticators, and that the way in which both hunters and domesticators use a given tool, method, or substance will reflect the nature of their interest in the animals. Human urine is used by hunters and domesticators, like the Chuckchi, who hunt wild animals in order to attract the prey. It acts to temporarily influence the animals' behavior. Do-

mesticators, like the Samoyed and Chuckchi when dealing with domestic herds, use human urine to control the animals' behavior.

In the case of the Chuckchi, the control exerted on the reindeer's behavior is minimal. It seems to be just enough to facilitate the exploitation of reindeer as a source of food (meat and blood) and clothing (hides). The degree of control exercised over reindeer by the Chuchchi does not permit, however, their exploitation as sources of milk or transportation. Minimal control and limited exploitation are features of incipient domestication.

There is evidence which suggests that some reindeer economies of the Upper Paleolithic could have been based on man-animal relationships such as the one which existed at Molino Cassarotto or the one existing among the Chuckchi. In the model which follows, I will examine the case for incipient domestication at three Magdalenian sites in Central France.

CHAPTER IV

MODEL: INCIPIENT DOMESTICATION IN THE PARIS BASIN

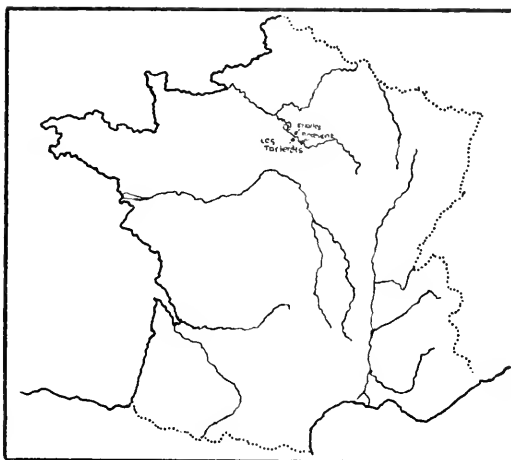
INTRODUCTION

Three sites, Pincevent, Etiolles, and Les Tarterets will be considered in this model. All are located in that area of North Central France known as the Paris Basin, and are believed to have been seasonal camp sites occupied in the Middle and Late Magdalenian periods, some 15-11 thousand years BP (before the present). Excavation at Pincevent has been under the direction of André Leroi-Gourhan and Michel Brézillon since the site was discovered during sand collecting operations in 1966. Etiolles, discovered in 1972, is being excavated by Y. Taborin and M. Brézillon. A twin site consisting of two separate but apparently contemporaneous camps, Les Tarterets has been partially excavated by Michel Brézillon and Beatrice Schmider.

PRESENT ENVIRONMENT

Pincevent is located about 50 kilometers south of Paris, in the Departement of Seine et Marne (see Figure 1). The area comprises the very furthest reaches of the suburbs, where fields of corn and alfalfa

Figure 1.
Location of sites in the
Paris Basin (shaded).



just begin to outnumber apartment complexes. It is an area of rolling hills, crisscrossed by two major rivers, two smaller ones, and several riverlets. Although the terrain has been altered considerably by sand collectors and road construction, the site appears to be situated about 25 meters above the Seine, on the left bank (see Figure 3). Winds traveling down the river valleys from the Northeast in the autumn make the area bitterly cold, hence the name Pincevent (pince: biting, vent: wind).

Located on the opposite bank of the Seine, and 20 km down-river from Pincevent is Etiolles (see Figure 2). The site is situated at the foot of a gradual limestone rise, which meets the Sénart Plateau, several kilometers away. Toward the river, the land slopes gently, and just opposite the site the river is forded by a series of small islands and a shallow area nearly 1 km long. On the right bank, opposite the ford are the twin sites Tarterêts I, and II, which are both no more than 1 km from Etiolles. The location of these sites is more agreeable than that

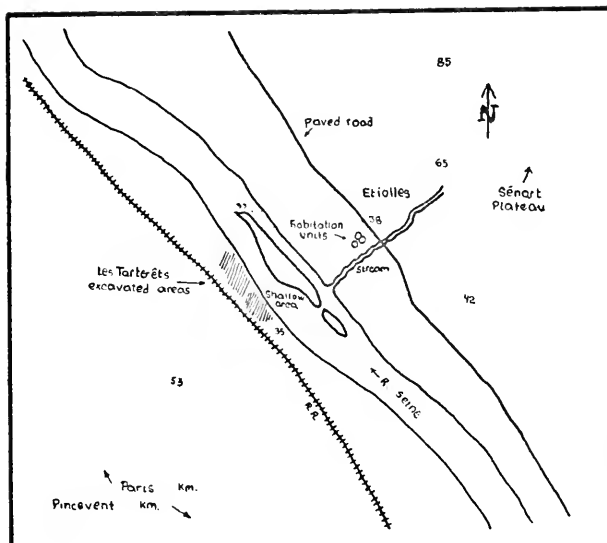



Figure 2.
Etioilles; Les Tarterêts
scale:  500m.
(redrawn from l'Institut
Géographique National-
France 1964).

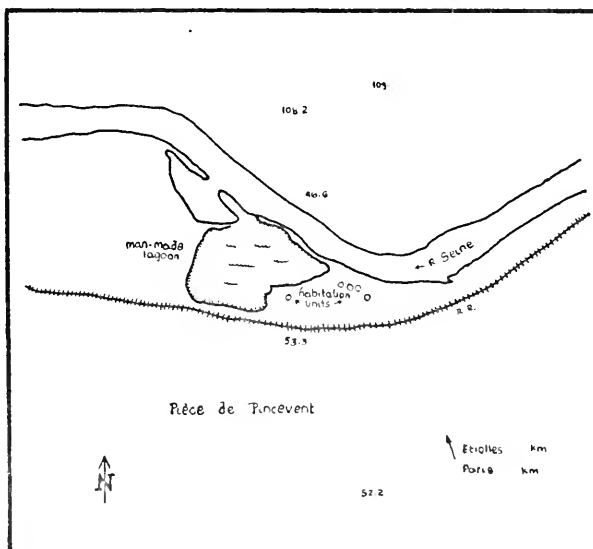



Figure 3.
Pincevent
scale:  500m
(redrawn from l'Institut
Géographique National-
France 1964).

of Pincevent, as it is sheltered from gusty winds by the plateau.

In general, the region is one of temperate climate, characterized by lowland plains, hills, and river valleys. The soil tends to be sandy nearest the rivers; farther away it becomes richer and supports cereal and other crops easily. Clay, limestone, and chalk deposits occur throughout the Basin. Flint, of varying color and quality is found in clay soils, or argile à silex, and is also indigenous to the Basin. The geographical extension of flint is tied to that of the clay-like sand deposits believed to have been formed during the Mesozoic and Tertiary eras (Brard 1950).

STRATIGRAPHY

At Pincevent, five principal levels are represented: I-Greco-Roman and recent historical, II-Bronze and Neolithic, III-Epipaleolithic IV- Upper Magdalenian and V-sand and gravel possibly of the Lower and Middle Paleolithic. Level IV is composed of finely stratified limons or colluvial sand deposited by successive inundations. Interspersed in the limons are a few layers of gravel - evidently deposited by temporary streams. Within level IV which is 1.30 m deep, four Magdalenian levels are represented. The presence of the woolly mammoth in the earliest suggests a date no later than 12,000 bp., as the creature vanishes from the fossil record of Europe at about that time (Leroi-Gourhan 1972: 9). C¹⁴ dates for the Magdalenian level at Pincevent range from 12,300 BP \pm 400 to 9,840 BP \pm 350 (Leroi-Gourhan 1971).

Detailed stratigraphic information is unavailable for the other two sites. As yet, only industry assigned to the Late Magdalenian has been found at Etiolles. This, and what palynological evidence there is

suggests that the site was occupied during a particularly cold period, probably the Younger Dryas (Taborin 1975). Excavations at Les Tarterêts have not been as extensive as at Etioilles, but it is assumed that both sites were occupied by the same culture group during the same period (Taborin 1975).

PALAEOENVIRONMENT

By ten thousand years ago, the last phase of the Late Glacial period had ended in Central Europe. The Younger Dryas, as it is called, had begun nearly two thousand years before, ca. 12,000 bp. It followed a relatively short humid interstadial, and was characterized by extremely low temperatures, but only minor glacial readvance (Butzer 1972). Palaeobotanical evidence is scarce from France; what there is, however, indicates that during this last cold phase the polar tree-line must have been well south of the present 46° latitude. A tundra climate probably existed in the Paris Basin as well as throughout most of Western and Central Europe (see Figure 4). The July mean temperature would have rarely exceeded 15° c. (Butzer 1972:200). Studies reveal a very small percentage of arboreal pollen, in this region but there is evidence of scattered parklands of spruce, birch and pine. Most of the land was tundra pasture, or steppe, which has a tremendous carrying capacity for both small rodents and large grazing animals (Butzer 1972).

Among the smaller animals which abounded in North-Central France during the Late Pleistocene is the brown hare (Lepus europaeus). His main biotope was the open steppe, stretching from Ireland to the southern parts of Russia (Kurtén 1968). Although conditions of preservation make verification difficult, there is evidence of a large hare population in

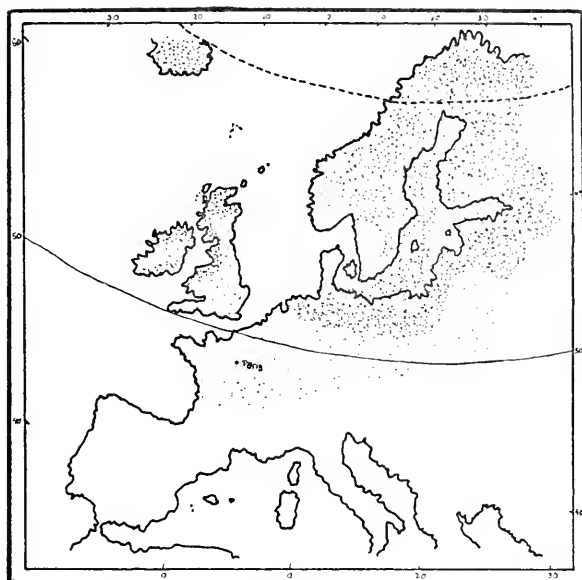




Figure 4.
Extension of tundra and tundra forest during last
Würm glacials
(redrawn from Butzer 1971 and *Scottish Geog. Magazine*)

arctic tundra  tundra forest 
(extension of discont. permafrost)

the Paris Basin (Leroi-Gourhan 1972:199). The brown hare was a staple in the diet of the wolf, also well represented in the fossil record of North-Central France (Leroi-Gourhan 1972:198). He seems to have been slightly smaller than the present day wolf, but the association of his remains with those of certain other animals suspected of being his prey, indicates that his habits have not changed. Like the wolf, the hyena is a specialized carnivore, and as expected is found to have occupied the same regions as the wolf (Kurtén 1968).

Other tundra dwellers were the woolly mammoth and the primitive horse. These are represented at the Basin sites in insignificant number, how-

ever, compared with the reindeer, which seem to have been the sole game of the human occupants of at least one site (Pincevent). There is some confusion as to the identification of the species of deer which inhabited the Paris Basin during the Younger Dryas. In his analysis of the bone industry of the Upper Palaeolithic, Bordes claims that the tools are made from red deer antler (Bordes 1968:163). However, if the region was tundra or steppe, it is unlikely that it was inhabited by red deer, since they usually confine themselves to woodlands (Kurtén 1968). It is possible that some red deer remained in the Paris Basin in the very early Younger Dryas, but there is only one species of deer which has been able to colonize a tundra biome. That is the Rangifer arcticus, or reindeer (Kurtén 1968).

REINDEER ECOLOGY

Reindeer are gregarious and, unlike red deer, strongly migratory animals. During the warmer months, they occupy open areas of rich grazing, and withdraw in winter to the edge of the forest belt. Sheltered there, they exist on mosses and lichens which they find under the snow (Kurtén 1968, Paterson 1956). An important feature in the ecology of the reindeer, seasonal migration prevents overgrazing and exhaustion of winter "lichen pastures", and keeps the herds in a healthy state by reducing the possibility of diseases reaching devastating proportions.

Migrations take the herd from one niche to another, but need not cover great distances. The distance a herd covers depends on the availability of food resources. In Lappland, reindeer exploit woodland winter grazing areas from November to March, when they move West

only far enough to preceed the advancing karre, or frozen slush which forms in the Spring and prevents grazing (Paterson 1956). During migrations, reindeer herds are well organized and unified. The Lapps attribute this to two phenomena. One is the reindeer "click" - an acoustic phenomenon apparently caused by a sinew in the toes, which at every step is pressed crosswise against an adjacent bone, thus emitting a "click" sound (Paterson 1956). Should any animals become separated from the herd, they may also be able to rejoin it by following the scent left by special glands between the cloven hooves of the hind legs.

The rutting season begins in the fall-October for most modern herds (Laufer 1917), Hatt, 1919). Rutting is most ardent toward the middle of October, and has ended by the last of November. Just before the rut, each stag establishes a seraglio of hinds within his territory. Left over stags contest for access to the hinds by challenging the established stag. Hinds line up to watch the battle; when it is over, the defeated stag retreats, and the hinds go to the victor. Shortly after the rut, older males lose their antlers. Younger males carry theirs into January, and female reindeer (which are the only female cervids to have antlers) do not lose theirs until calving season (Paterson, 1956, Richardson 1953). Calving takes place in the early summer, although some calves are born in the beginning of autumn. Calves so late born, however, do not usually survive the winter. Calves are dependent upon their mothers for milk until the end of November when they begin foraging for themselves.

Reindeer fall to the same diseases which plague other herd animals

anthrax, foot rot, and they can become ill from too much salt, flies, and certain types of lichen (Hatt 1919, Richardson 1953). Ailing reindeer are removed from the herd by predators such as the wolf, bear, and wolverine. Healthy, adult animals are rarely attacked by predators.

HYPOTHESIS

To be tested in this model is the hypothesis that Pincevent, Etiolles, and Les Tarterêts were roughly contemporaneous seasonal camp sites of reindeer followers who consciously exerted at least a minimal influence on the behavior of the reindeer and who were, therefore, incipient domesticators.

CRITERIA FOR TESTING

If this hypothesis is correct, then the archeological record should reveal

- a.) evidence of contemporary occupation
- b.) evidence of human dependence on reindeer
- c.) evidence of seasonal occupation
- d.) discrepancies in age/sex ratios
- e.) evidence of animals' habituation to man

Application of the first criterion will situate the sites in time, and establish the identity of their occupants. The second criterion will indicate the significance of a particular element in the behavioral environment in the human subsistence pattern. Application of the last three criteria will characterize the nature of the relationship existing between man and that particularly significant element.

TESTING

CONTEMPORARY OCCUPATION

Absolute dates have only been obtained for Pincevent (see page 52). Unfortunately, samples from Etiolles and Les Tarterêts which were to be dated by the C^{14} method were found to have been contaminated (Taborin 1975). Faunal remains and artifactual evidence from those sites, however, suggest a time period not inconsistent with that indicated for Pincevent.

Faunal and floral analyses do not yield absolute dates, but serve to situate an assemblage in geologic time. Conditions of preservation may make this sort of dating unreliable, and must be taken into consideration. In the ^{Paris Basin} ~~PS~~, soil conditions are not optimum for preservation. No floral remains have been found in the humid, sandy soil, and only teeth and denser bones of larger mammals have been found in relatively good condition. Enough has been uncovered, nevertheless, to allow guarded speculation about the time during which the sites were occupied. The following table shows the faunal representation at Pincevent, section 36.¹

¹
Section 36 is the area 25m² which has been most thoroughly excavated since 1967. Within the Magdalenian levels alone, it has yielded at least three complete tent sites, several hearths, a varied flint assemblage, and extensive lightC and bone debris. The first section to receive attention at Pincevent was Section 1. It contained a Magdalenian level similar to, but probably earlier than that of Section 36. The question of the anteriority of Section 1 to Section 36 is an interesting one and its investigation could contribute much to our present understanding of Magdalenian settlement patterns. It is not, however, necessary that the relation of the two sections be determined in order to investigate the subsistence pattern at one. The dater used in this study will pertain only to Section 36, unless otherwise noted.

 FAUNAL REPRESENTATION AT PINCEVENT

SPECIES	ESTIMATED NO. OF IND. ²
Wolf	2
Bird	2
Horse	1
Hare	1
Mollusk	4
Reindeer	43

(From Leroi-Gourhan, 1972)

Figure 1

Positive determination of number of individuals for each species has not been made for the other two sites, but at both, the reindeer is present in greatest number, followed by the wolf, horse, and hare (Taborin 1975) (see Table 1). The presence of such a significant number of reindeer would suggest a tundra, or forest/tundra climate. Primitive horses, wolves, and hares are also known to have inhabited the same environment (Kurtén 1969). Unfortunately, no small mammals, such as rodents, have been found. They are generally less tolerant of climatic changes; their populations, therefore, reflect changes more readily than do populations of large animals.

The presence of reindeer, which exist only in tundra-like environment within migration distance of forest places the occupation of the sites in the last stages of the Late Pleistocene. It was during that period that the environment of Central France was tundra and forest/tundra (Figure 4) (Butzer 1972:292).

 2

Determination of number of individuals: Wolf: two right radii; horse: a tarsus, one left molar; bird: one egg, hares: jawbones, reindeer: mandibles. See Leroi-Gourhan 1972: 141-203.

It is interesting that in the lowest, and presumably earliest levels of both Pincevent and Etioilles, remains of woolly mammoth have been uncovered (Leroi-Gourhan 1969). To date, it has not been found but in that early level. It seems to vanish from the fossil record of Central and Western Europe at the end of the last interstadial, just before the Younger Dryas began. Whether climatic change was a factor in its demise or not,³ its presence in comparable (if not contemporaneous) levels at both sites, and its absence in later levels would seem to suggest the contemporaneousness of cultures occupying the sites at the same time as the mammoth.

In sum, the combined faunal inventory of all three sites suggests an environment characterized by open steppe and forested tundra, as such an environment almost certainly existed in that region during the last Würm glacial period, it can be assumed that cultures, coexisting with that fauna existed during the same period.

Such a determination may be a step in the right direction, but it proves no more than that the sites were all occupied at some time within the Würm III/IV - Wurm IV, Periods, which may have lasted several thousand years. In order to determine more precisely whether the sites were occupied at the same time, it will be necessary to examine cultural artifacts. The assumption here is that cultural artifacts evolve through time, and if the various stages of development are known then the relative period in time at which a particular artifact appears can be

3

It has been suggested (by Bordes 1963 and Leroi-Gourhan 1972) that technological developments (the invention of the bow, in particular) at the end of the Paleolithic permitted more efficient hunting which resulted in the "overkill" of many large game animals.

determined. The presence at sites of artifacts peculiar to a certain period suggests that the sites were contemporaneous.

By far the most well represented class of artifacts found in the Paris Basin are stone tools. Fireplaces, patches of ochre, and tent perimeters are also cultural artifacts found in the region but their relative scarcity has prevented the study of their evolution. Stone tool industries throughout most of Europe during the last stages of the Pleistocene are classified as belonging to the Magdalenian culture. The culture appears during the Würm III/IV interstadial, and disappears with the advent of the Postglacial period, ca. 9,500 bp (Bordes 1968). Magdalenian tools evolve through six stages. For the most part, flint implements do not undergo important modifications in the later half of the Magdalenian; tool classification is based on the development of barbed harpoons. Harpoons have yet to be found in the Paris Basin, and so flint implements found in the area are assigned to the different Magdalenian stages to which their type belongs in other areas where the harpoons are found. At present, most stone implements uncovered in the Basin have been assigned to the last four stages of the Magdalenian. On the basis of assemblages found elsewhere in France, these last stages are characterized by the large number of blade tools and burins, and by curved back knives, Font Brunel points, geometric microliths, and parrot-beak burins, which appear in the most recent assemblages (Bordes 1968).

At Pincevent blades and bladelets account for 65.02% of the total assemblage.⁴ They occur in large numbers, too, at Etiolles, where they

4

Unfortunately no quantitative data are available for the lithic assemblage at Les Tarterêts. Except for the absence of extraordinarily long blades, it appears contain the same tool types in similar proportions as the Etiolles assemblage (Taborin: personal communication, April, 1976)

TABLE 2
RELATIVE FREQUENCIES OF STONE TYPES
AT PINCEVENT AND ETIOLLES
(after Leroi-Gourhan 197 and
Taborin 1975)

PINCEVENT			ETIOLLES	
Tool Designation	Number	Percent of total assemblage	Number	Percent of total assemblage
<u>BLADES</u>				
backed	2			
truncated	12			
denticulated	2			
other	<u>21</u>			
Total	37	2.69%	850	86.60%
<u>BLADELETS</u>				
backed	671			
truncated/backed	5			
other	<u>1</u>	62.93%	72	7.33%
Total	677			
<u>BURINS</u>				
dihedral	18			
truncated	2			
multiple/truncated	1			
multiple/mixed	5			
other	<u>115</u>			
Total	142	12.14%	36	3.66%
<u>BORERS</u>				
simple	69			
parrotbeak	7			
multiple	6			
micro	<u>56</u>			
Total	125	12.53%	11	1.12%
<u>SCRAPERS</u>				
simple	61			
double	3			
scraper/burin	5			
other	<u>20</u>			
Total	89	8.07%	12	1.20%

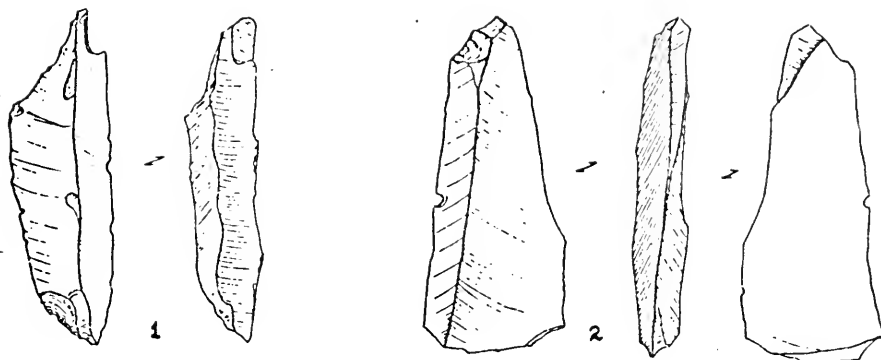


Figure 7. Burins: Etiolles (From Taborin 1975)
1-truncated, 2-multiple truncated.

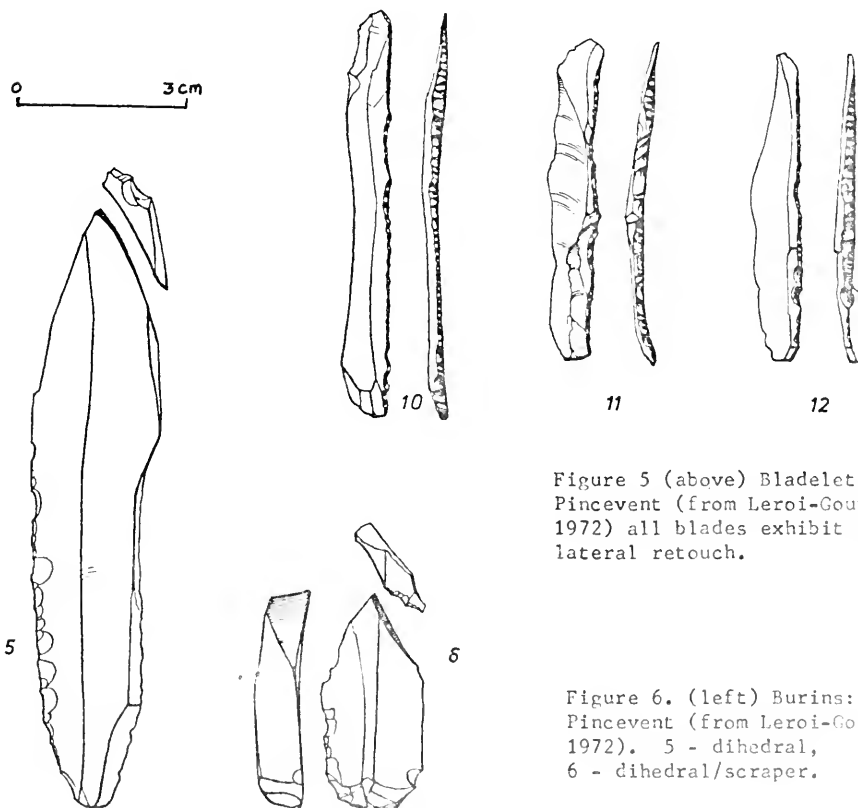


Figure 5 (above) Bladelets:
Pincevent (from Leroi-Gourhan
1972) all blades exhibit fine
lateral retouch.

Figure 6. (left) Burins:
Pincevent (from Leroi-Gourhan
1972). 5 - dihedral,
6 - dihedral/scrapper.

Figure 8. Borers: Pincevent (from Leroi-Gourhan 1972)
a. - microborers on burin chips.
b, c - bilaterally retouched borers on flakes.
d - double ended borers.

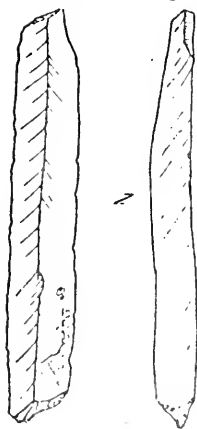
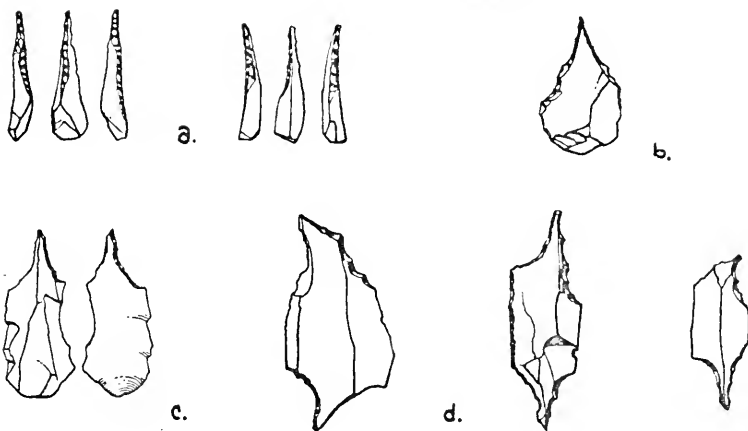


Figure 9
Beak: Etiolles (from Taborin 1975)
burin/beak on blade.

0 3cm.

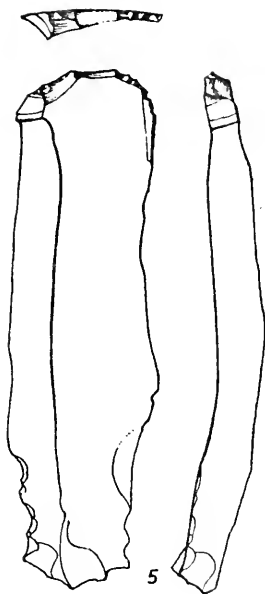
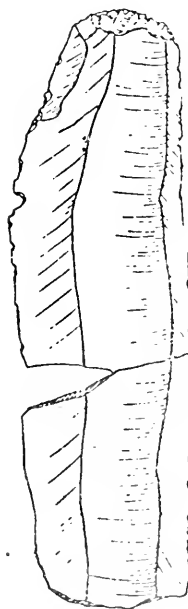


Figure 10. Scraper: Pincevent
(from Leroi-Gourhan 1972)

Simple ended scraper on blade

Figure 11.
Scraper: Etiolles
(from Taborin 1972)

Simple ended scraper on blade.



0 3cm.

exhibit the same types of fine lateral end retouch (see figure 5) There is a striking difference, however, in the relative length of blades from the two sites. The average length of blades at Pincevent varies from 13 mm. to 70 mm., and most blades known from Etiolles have fallen within the same range (Taborin 1975). Recent excavations at that site have yielded blades as long as 610 mm.

Burins constitute more than 12% of the Pincevent assemblage (see Figure 6, Table 2). They are, after backed bladelets, the most common tool. While they are common at Etiolles, they do not constitute such a significant part of the assemblage (see Table 2). Burins from both sites are of approximately the same style and dimensions.

Borers, made from flakes and blades (and at Pincevent, burin chips) are known at both sites, although they are not as numerous at Etiolles as they are at Pincevent (see Table 2). The borers and beaks at Pincevent are generally very small tools, fewer than 50 mm. in length (see figure 8). They exhibit both lateral and alternate retouch, and frequently occur in multiple form.

Scrapers are more numerous and varied at Pincevent than at Etiolles (see Table 2). The ends of simple scrapers are rounded; narrow scrapers have semicircular ends, whereas wider scrapers have broader, less curved ends (see Figures 10,11). Retouch on scrapers at both sites is rarely abrupt. The size of scrapers at both sites is comparable.

As yet, no bone tools or implements of any kind have been uncovered at Etiolles, but a few javelin points and fragments of two shaft straighteners (all of antlers) have been found at Pincevent (Leroi-Gourhan 1972).

Blades and bladelets are by far the most common tools at both Etiolles and Pincevent. They are followed in quantity at both sites by burins and

borers. Retouched flakes are not common at either site, although they are more frequently found at Etiolles. Geometric microliths are all but absent at Etiolles, but do appear at Pincevent. In other assemblages in France, flake tools are generally more common in the early part of the late Magdalenian, whereas, microliths are more common in the very last stages (Bordes 1968). This might serve to antedate Etiolles in respect to Pincevent. Before dissimilarities in the assemblages are attributed to different stages in technological evolution, however, two points should be considered. First is the quantity of flint cores. A total of 111 were found at Etiolles, whereas cores are rare in the Pincevent inventory (Taborin 1975; Leroi-Gourhan 1972). Y. Taborin and M. Brézillon at Etiolles have demonstrated that in many cases, flakes, chips, and blades are found near the cores from which they originated. The reconstruction of a core in habitation A7 is an example (see Taborin 1975). Such close association of cores, unused tools (as many blades were), and products of debitage suggests a tool-making area. Tool-making occurred at Pincevent, to be sure, but Leroi-Gourhan (1972) feels that it was probably carried out only to maintain the group's collection of workable tools, and that it need not have demanded significantly more time or collective interest than any other necessary camp activity. There is reason to believe that tool-making was more important to the inhabitants of Etiolles. Debitage areas at Pincevent occupy spaces of no more than 1 meter in diameter, situated three-quarters of the way around the main hearths. In contrast, debitage areas at Etiolles (A 17, for example) may occupy areas of up to 2m^2 (see Figure 12). It is unlikely that such areas were necessary to maintain the inhabitant's tool



Figure 12
Debitage near habitation A 17 at Etiolles
(From Taborin 1975)

kits. The reason for the extensivedebitage areas at Etiolles remains unknown, however, the second point to consider is that the most striking difference in the two assemblages does not concern relative frequencies of tool types, but rather the relative size of blades. Blades from Pincevent vary in length from 1-7 cm.; from Etiolles, 4-61 cm. (Taborin 1975). The uncommonly large blades at Etiolles bear few or no traces of use, whereas most blades at Pincevent do (Leroi-Gourhan 1972). The difference in blade size is probably not a functional one, but the reason for the variation is not known.

In any case, the differences which exist between the lithic assemblages of Pincevent and Etiolles are not of the nature which would indi-

cate different stages in technological evolution. Differences in relative frequencies of tool types alone may suggest, but do not define such evolutionary changes. The few differences in tool type frequencies which are evident are not significant enough to indicate completely different cultures or stages in technological development. They may suggest, however, some degree of functional variation between the assemblages. This suggestion will be explored more fully in the discussion of the exploitation of resources and use of tools, which follows.

At this point, it can be concluded that all tools in both assemblages are of the type, and exist within an acceptable range of relative frequency to be considered vestiges of the Late Magdalenian culture. If we exclude the unlikely (but often suggested) possibility that two vastly different cultures could develop highly similar, if not identical, industries, and if we return to the original assumption that artifacts peculiar to a given period suggest contemporaneity of sites containing them, then we may conclude that Pincevent, Etiolles, and Tarterets were occupied by groups of the same culture during more or less the same period.

SEASONAL OCCUPATION

It now must be determined that the sites were seasonally occupied and that occupation of all sites was during the same season(s). Seasonal occupation is used here, as Butzer defines it: occupation of some months duration (Butzer 1971:404). From what is known about the Palaeo_environment of the Basin, it can be inferred that the sites were not occupied during the winter. During the winter, tundras are swept with winds and covered in snow. The winter tent-complex at Borneck

(Butzer 1971:480) is evidence that Magdalenians were able to cope with such harsh environments, however, it should be noted that the inhabitants of Borneck were subsisting on animals which could successfully occupy that environment, whereas, the Magdalenians of the Paris Basin appear to have been dependent upon reindeer, which do not occupy open, snow-covered tundra. During the winter, reindeer move into forested areas where they find shelter and food. It can be assumed that a human group highly dependent upon them would also move into, or nearer the forest during the winter, unless they were able to exploit another food source. There is no evidence that the occupants of the Basin exploited any other food source to the extent that they did the reindeer (This will be discussed in greater depth shortly). The sites, then, seem to have been occupied sometime between the spring and winter. This is further substantiated by antler and bone inventories.

As J. Bouchud (1966) has shown, the stage of tooth eruption and degree of wear are indicators of an animal's age. Bouchud's method of age determination has been applied by Leroi-Gourhan in the analysis of reindeer dentition at Pincevent. The representation of certain age groups suggests a seasonal occupation. Summer occupation is indicated by the presence of individuals in the 0-3 month age group. Most of the calving, it will be remembered, takes place in the early summer. Animals killed which were fewer than 4 months old would have been killed before the end of August or so; those of more than 4, but fewer than 12 months old would also have been killed in the same season - of the year following their birth. While they are represented, individuals in the 4-12 month group are relatively few. Bouchud notes that not yet entirely calcified teeth of young animals may disintegrate under the weight of

sediments which cover them, and that this could explain their relative scarcity (Bouchud 1966:128). Leroi-Gourhan maintains however, that if they were indeed present at one time, they must have disappeared due to some sort of organic or chemical corrosion, since crushed teeth are visible and have actually been found in the fine limons of the site. (Leroi-Gourhan 1972:163). Whatever the reason for their scarcity, their presence is positive indication that the site was occupied between June and September.

Representation of male and/or female antlers is also indicative of the season of occupation. Antlers of male reindeer have a main stem 35-41 mm. in diameter (Leroi-Gourhan 1972:158); those of females are much smaller, having a stem of fewer than 25 mm. in diam. It is possible, as Bouchud explains (1966), to determine whether an antler was shed or removed from a killed animal, by examination of the pedicel, or base of the antler. The presence of shed antlers of both sexes indicates occupation during the months when antlers are shed - August and October. Most male antlers, shed and butchered, show traces of use, and many appear to have been worked, as if in the production of javelin points or other implements (Leroi-Gourhan 1972: 158-159). This suggests autumn occupation, since it is during that season that adult males use their antlers in rutting battles, and in which, therefore, their antlers are the most compact and most suitable as tool-making material. The occupation of Pincevent seems, then to have run from the early summer (June) through the end of autumn (November). Estival and autumnal occupation patterns are also suggested for Etiolles and Les Tarterêts (Taborin, 1975)

HUMAN DEPENDENCE UPON REINDEER

The almost total dependence upon reindeer as sources of food, clothing and shelter of the sites' occupants is suggested in two ways: first, by the relative scarcity or absence of any other game which could have provided what reindeer did not, and second, by indications that the occupants did, in fact, take advantage of abundant supplies of meat and reindeer by-products.

As noted earlier (Figure 1), no mammals other than the reindeer are represented in significant number at any of the three sites. There is likewise negligible evidence of birds and marine life which are known to have existed in the Paris Basin during the Late Pleistocene. This may indeed suggest that reindeer were the only animals exploited and that the Magdalenians were dependent upon them. There are, however, other possible explanations for the reindeer's dominance of the faunal inventory. One is that due to conditions of preservation, the fauna of ten thousand years ago are not accurately represented (in terms of relative frequencies) in the archeological record. Poor preservation is almost certainly to blame for the scarce representations of small mammals and birds, and perhaps also for the scarcity of shellfish - all of which have been found in Upper Palaeolithic habitation sites elsewhere (Le Moustier, for example), but it does not explain the absence of the horse, whose bones are as resistant to corrosion as the reindeer's (Leroi-Gourhan 1972:142). Evidently, the horse was not exploited by the Magdalenians in the Basin to the extent that the reindeer was. The reason for this could be that reindeer were preferred for some quality, that they were easier to capture, or that horses simply weren't around. The last is probably the most

likely explanation. Different species which occupy the same type of environment and subsist on the same food usually do not occupy a particular niche simultaneously. This is particularly true of herd animals. Therefore, if the horse existed in Central France during the Late Pleistocene, competition with the reindeer probably prevented it from occupying the Basin in any number during the times when the reindeer were there.

Another explanation which could be offered for the seemingly disproportionate abundance of reindeer is that the sites were not habitation sites at all, but job specific ones. Bone inventories from the sites may not be reflective of the occupants' subsistence and living activities; rather, they may indicate the practice of a single type activity - in this case, one dealing with reindeer slaughter and preparation.

Lithic assemblages at each site contain tools associated with butchering and hide preparation: becs, borers, end and side scrapers, perçoirs, and various blades. That such tools were actually employed in butchering and hide preparation is suggested by the traces of use on them (Leroi-Gourhan 1972:65). Traces on end scrapers from all sites indicate that they were held by the heel and pushed away from the body, over a relatively soft material. Traces of use on all edges of borers at Pincevent suggest use in perforation of soft materials, such as hides (Leroi-Gourhan 1972:41). They may also have been used to drill holes in bone or antler, but the absence of borers with broken points makes it unlikely that they were used to perforate very hard materials, such as stone or shell (Leroi-Gourhan 1972:41).

It is not necessary to look for a strict interassemblage functional variation to see that activities other than butchering took place at the sites.

The construction and apparent duration of the habitation units is further indication that the sites were not simply kill sites. Units at Pincevent and Etioilles appear to have been sizeable, covering areas of up to $7m^2$, including living space, hearth, and associated areas of debris (Leroi-Gourhan 1972: 247-250; Taborin 1975: 5-22). The living spaces at Pincevent were probably covered with hides supported by wooden poles planted in an open circle, converging at the top. No postholes remain, and the only clue to tent dimensions is the distribution of ochre, bones, and lithic debris. The three habitation units at Pincevent appear to have been of similar construction. They consist the area sheltered by the tent (C,B - see Figure 13), the hearth (A) and several zones of debris (B^2 , D, E, F, G,). Ochre, found in all Magdalenian habitation sites, is distributed evenly within the perimeter of the tent. It occurs elsewhere about the site, but in uneven distribution. Some spaces in the tent are free of ochre (C), probably indicating areas where sleeping material was laid. The hearths of the three principal domestic units are of the large basin type (Leroi-Gourhan 1972: 219). They were dug into the ground, and bordered with large stones forming a roughly circular hearth of 60-90 cm in diameter (Leroi-Gourhan 1972: 221). The basins are not spherical; one side slopes more gently than the others. The slope was evidently created by the firetender when he drew the earth toward him in making the fireplace, and was maintained by the periodic raking out of cinders.

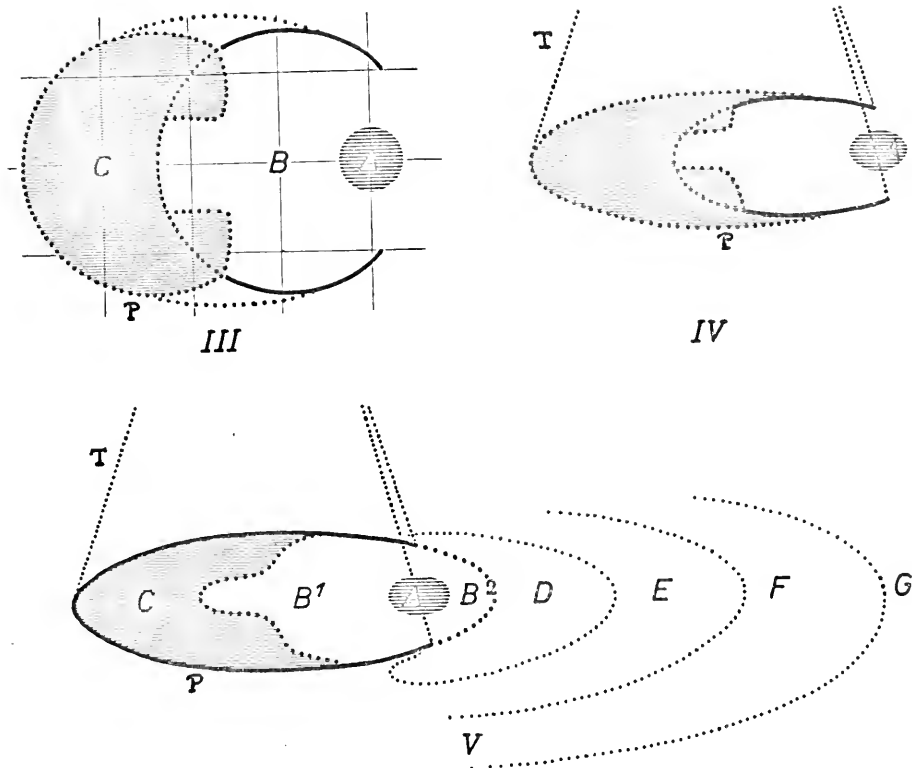


Figure 13

Scale= _____ =1m.

Distribution of ochre, bone and lithic debris about domestic units at Pincevent (from Leroi-Gourhan 1972).

III Top view of the covered living area.

IV Angle view of covered living area.

V Angle view of living area, and various zones of debris.

A-hearth; B - area of most domestic activity; C area free of ochre - probably sleeping area; D - nearby refuse; E - dispersed refuse; F - occasional refuse; P - perimeter of tent; T - supposed placement of hides.

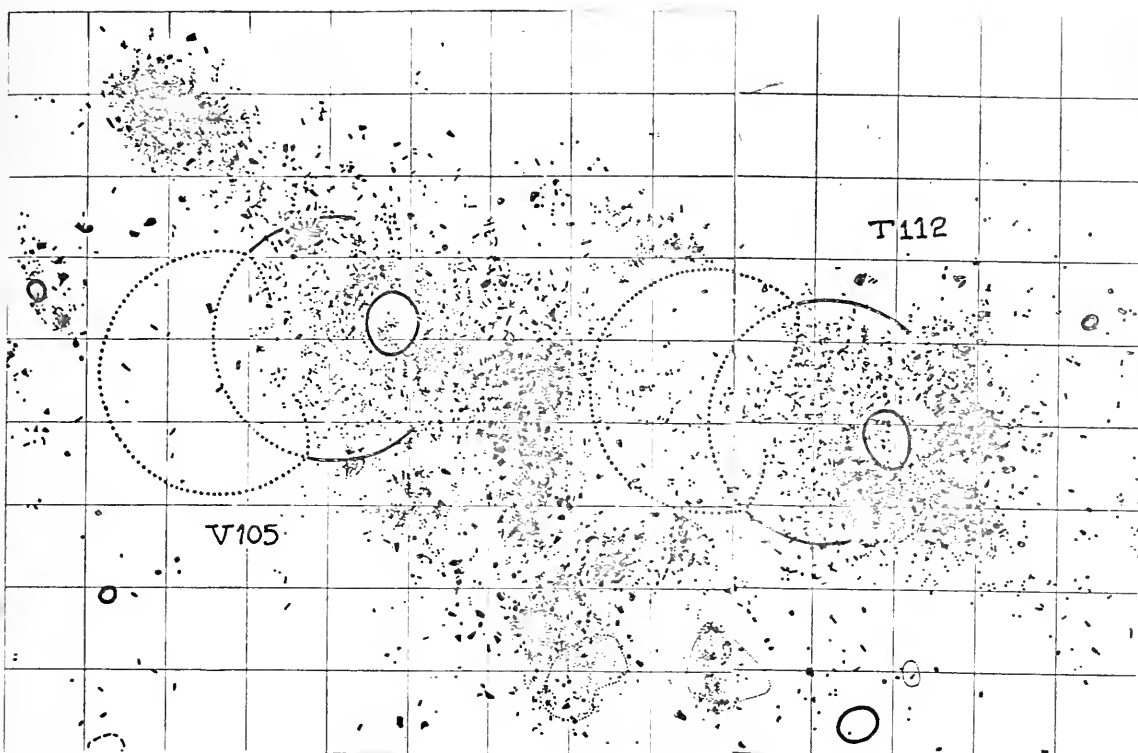


Figure 14.

Showing lithic and bone debris distribution
about habitation units V105 & T112 (Leroi-Gourhan 1972).

Ashes were dumped in ash piles not far to the South or West of the hearths (M. Julien in Leroi-Gourhan 1972: 283-286). The condition of border stones, often cracked and fallen into the basin, is an indication of frequent, if not constant use over a considerable length of time. A long period of use is also suggested by the burned earth in the basins and under the border stones.

Lithic debris is in greatest concentration in a semicircular area around the side of the hearth opposite the entrance to the shelter (see figure 13). Habitation VI05 (see figure 14) is exceptional, as lithic and bone debris are concentrated in an area diagonal from the hearth. Apparently the entrance to VI05 opened on to the back of another tent, T112, forcing the occupants of VI05 to sweep their debris to the side. Bone debris are distributed around the other hearths, and both inside and outside the perimeters of the tents. Generally, debris nearest the hearths consists of smaller bones (ribs, mandibles, hyoids), and that farther away consists of larger bones (antlers, pelvic bones, scapulae, and femurs) (Leroi-Gourhan 1972). Where broken antlers and long bones are found near hearths, complete specimens of the same type are not. The few bones which bear tool marks are distributed with unmarked bones of the same type. Marks and traces on all bone material (with the exception of bones and antlers destined to become tools) appear to have been left by flint implements in butchering processes (David, in Leroi-Gourhan 1972: 317-320).

Other habitation units may be suggested at Pincevent by several other hearths. Those hearths are smaller, however, and are not associated with any sort of patterned distribution of ochre, bones, or lithic

debris. Moreover, they do not appear to have been used over an extended period of time, as there is no burned earth in them, and none of the border stones is heat-cracked. It is unlikely that they represent important domestic units, although they may have been built for temporary or auxiliary tents (Leroi-Gourhan 1972).

Excavations have revealed no domestic units at Les Tarterêts, but at least three have been found at Etiolles. One is suggested by a large basin hearth, which was curiously filled in with lithic debris, pebbles, and other material (Taborin 1975). The tent perimeter is not visible, but several large stones and flat rocks are among the debris scattered to the Southwest of the fireplace, and Taborin (1975) believes they may well have served to secure hides around the bottom of the tent.

An especially well constructed tent is indicated by an open circle of stones and an elaborate fireplace. Great care was taken in the construction of this tent, as the stones, each weighing several kilos, were not indigenous to the site, but had to have been carried from Champigny, a few kilometers away (Taborin 1975). These stones were placed directly on top of debitage flakes, suggesting that the spot had been occupied for some time before the tent border was set up. The entrance to the tent is indicated by a break in the circle, facing Southwest. A third habitation is suggested by a rocky hearth, bordered on two sides by a double row of small stones, and by the distributions of ochre and debris (Taborin 1975).

At Etiolles, the lithic debris is remarkable in quantity and diversity. The assemblage contains tools associated with butchering and hide preparation (blades, side scrapers, etc.), and traces on them

show they were actually used in that capacity (Taborin 1972). Other tools in the Etiolles assemblage are not associated with these activities, however, the very number of tools and quantity of toolmaking debris indicates that another activity besides butchering - toolmaking - was important at the site.

At both sites, the size of the tents and care with which they were constructed suggest at least the intention of a long and relatively comfortable stay. The hearths seem quite adequate to accomodate the needs of a cook and toolmaker, and they contain evidence that both did indeed use the fireplaces for a considerable length of time. Furthermore if Pincevent and Etiolles were kill sites or butchering centers, they would surely have processed more than the fifty or so animals which they did during their extended stay. It seems fairly certain that the sites were settlement areas, and not job-specific sites. However, differences in relative quantity of bone and lithic debris at the two sites may suggest specialization of activities the possibility has been suggested by Taborin (1976 personal communication) that the occupants of Etiolles specialized in toolmaking, and engaged in some sort of cooperative exchange with other sites. It is improbable (although possible) that they traded with the group at Pincevent. The lithic assemblage and supposed bone tool assemblage reflect an industry at Pincevent which would have supplied the occupants with every kind of tool they could have made use of, given their (suspected) subsistence pattern (Leroi-Gourhan, Khulman 1976: personal communication). Furthermore, none of the extraordinary blades, which seem to have been the specialty of Etiolles, have been uncovered at Pincevent. There are

fine blades at Pincevent and they may indeed have come from Etiolles; however, there is no way to be sure since many of the blades are of the same slate-gray flint. It will be interesting to see if any of the Etiolles-type blades turn up at Les Tarterêts. Perhaps the bone inventory will be more important at the twin sites, strongly suggesting technological and economic cooperation. The investigation of this possibility must await further excavation.

If we assume that the sites were settlement areas and that exchange with other groups played if any, a negligible role in their subsistence pattern, then we may assume that the occupants exploited the fauna which is represented on the sites. The question follows as to whether or not the sites' occupants could have been supported by the amount of food represented. Leroi-Gourhan (1972: 143-164) estimates that the occupants of Pincevent were more than adequately supported by the reindeer. Allowing an average of 50 kg edible soft parts for each of the 40 animals found, it can be calculated that each of 15 people living in 3 tents (5 individuals per tent) for a period of 5 months could have consumed as many as 850g of meat per day (Leroi-Gourhan 1972: 143). The condition of bone material and state of excavations has not permitted similar calculations for either Les Tarterêts or Etiolles. Nevertheless, preliminary estimations by Taborin (1976: personal communication) suggest a high level of meat consumption.

The daily allowance for Pincevent occupants seems rather high, especially if one considers that not all of the people could have consumed that much, and ~~few~~ could have consumed more. Children would have been able to eat considerably less, and even the heftiest adult male

could not have eaten much more. It must be remembered, too, that other foods were almost certainly part of the diet. Unfortunately, no trace of vegetal foods remains, and their relative importance is impossible to estimate.

Furthermore, meat was not the only part of the reindeer which was eaten. Long bones, uniformly broken, are found in high relative frequency (to unbroken ones) at all sites near domestic units, particularly around the hearths (Leroi-Gourhan 1972: 164, Taborin 1976, personal communication). This strongly suggests the consumption of marrow, a rich and nutritious food. The presence at each site, too, of heat-cracked rocks suggests the practice of stone boiling, which could well have provided soup (Leroi-Gourhan 1972, Taborin 1975). Considering that meat comprised only part of the diet, the daily meat consumption suggested for Pincevent appears unrealistically high. Miscalculation of the human population may account for this. It is possible that the human population is under represented by the few habitations yet uncovered. Also underestimated could be the duration of occupation. The period of five months used in the calculation is, however, verified by antler and bone analysis (see pp70-71) and is considered to be fairly accurate. Even if an occupation of as long as seven months were indicated, the reindeer would have provided 600 g. of meat per day for each individual (Leroi-Gourhan 1972: 143). The estimation of average daily consumption may rise further if we consider the all too likely possibility that the number of animals actually killed could be under represented due to the work of scavengers or poor preservation. A more accurate estimation of food consumption will be possible only after

more extensive excavation - if then.

At this point, the evidence is sufficient to permit the conclusion that the inhabitants of Pincevent, Etiolles and Les Tarterêts made good use of the reindeer as a source of food, shelter, and probably clothing as well. The apparently very efficient exploitation of reindeer and absence of evidence for the exploitation of any other food source are positive indications that the sites' inhabitants were highly dependent upon the reindeer.

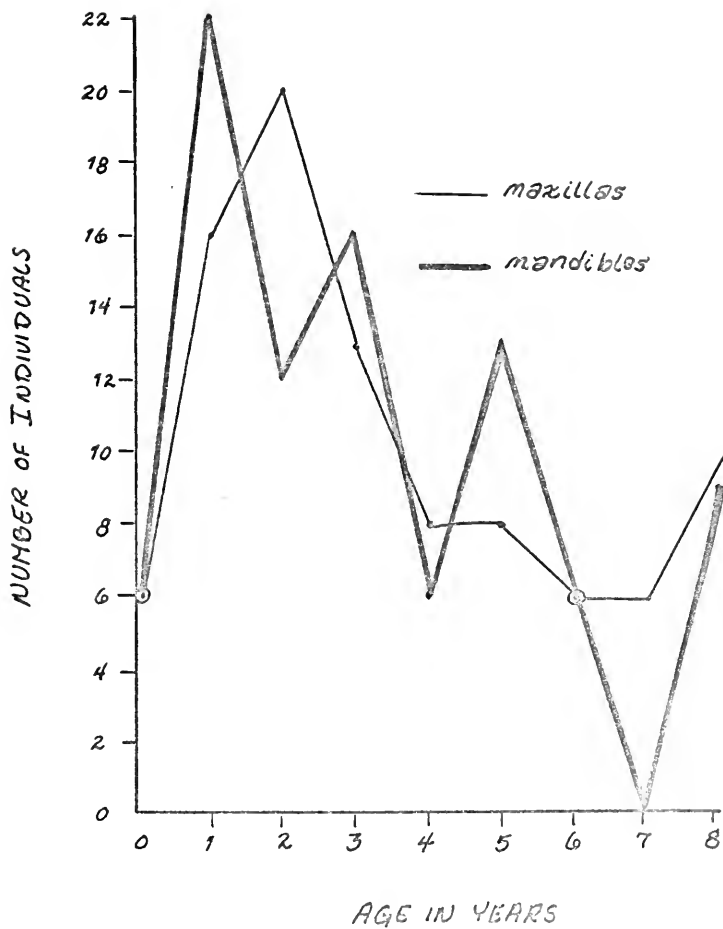
DISCREPANCIES IN AGE/SEX RATIOS

Bone remains at Etiolles and Les Tarterêts are too poorly preserved to furnish any information about the age groups or sex ratio within the number of reindeer killed there. Age groups are identifiable in the Pincevent inventory, and have been determined on the basis of dentition (see Leroi-Gourhan 1972: 160-165, 298). From 60% - 70% of the individuals represented appear to be fewer than 3 years old (see Figure 14). Fewer than 25% of that group and only 14% of the total population are individuals under 3 mo. old. The 4-6 year age group is represented in slightly greater number, followed by the 7-8 year group, which constitutes about 20% of the total.

The data indicate that the favored prey were immature animals, between 1 and 3 years of age. Female reindeer are able to bear calves at about 3 years, and males mature shortly after that (Richardson 1956). It is significant that few (10-15%) older animals, except the very old, were killed. It could be argued that mature, able animals would have been the most difficult to bring down, and that explains their poor

Figure 14.

AGE REPRESENTATION
at Pincevent
(after Leroi-Gourhan 1972
Figure 191, p. 298).



representation, however, reindeer of just a year old are equally capable of out-running or outwitting hunters. Clearly, the younger animals were selected for some other reason.

It should be emphasized that these animals were not newborns. Newborns at Pincevent would have been all individuals fewer than about four months old, given that reindeer calves are born in the spring and summer, and that the site was occupied during those months. Newborns constitute a curiously small percentage of the animals killed. Data are unavailable for the sex ratios of present and past reindeer populations during calving season, but one would certainly expect mature females to make up more than 10% of a group with newborn calves. If most mature females had one calf, the calves would surely constitute more than the 14% of the population which is suggested by the Pincevent data. Furthermore, if these reindeer were the prey of hunters, it would be difficult to imagine so small a percentage of easy prey - especially during the season when easy prey is so abundant.

Determination of the sex of reindeer killed at Pincevent has been difficult due to the fragmentation and poor preservation of bone material. Males and females were indeed on the site, as evidenced by the presence of both male and female antlers. A renewed effort to determine sex has been made in recent months; as yet no positive estimations are possible, but it appears that males are represented in significant number (David, F. 1977, personal communication).

The selective slaughter pattern so clearly indicated at Pincevent is fully consistent with the pattern outlined earlier for incipient domestication: The breeding members of the population are spared, while immature and aged individuals are culled.

SLAUGHTER PATTERNS

There is no evidence that stampeding was practiced at or near any of the sites. Neither is there evidence that reindeer were killed with projectiles. No projectile points have been found in association with any bones, and then only at Pincevent have any marked bones been found. The markings on them are those expected to be made in usual butchering processes (David, in Leroi-Gourhan 1972). This does not mean, of course, that stampeding and hunting with projectiles did not occur. They may have. There are, however, a few other facts which lead Leroi-Gourhan (1972) to doubt that such hunting methods were practiced. One is that all parts of the reindeer skeleton, except the extremely fragile facial bones are represented at Pincevent (Leroi-Gourhan 1972: 151). Stampedes cannot be successfully carried out near, or even short distances away from established settlement areas. The necessity of carrying (presumably on foot) the meat over some distance would make it worthwhile to take only those parts of the animal which had the highest proportion of edible material per weight unit. Thus it is found at most stampede sites that all flesh, some organs (tongue, brain) and marrow containing bones were removed from the site (the Casper site, for example: Frison 1974) leaving the heavy skulls, vertebrae, and pelvic bones. The presence of vertebrae and pelvic bones at Pincevent, suggests that the animals were killed at or near the camp site, and not with stampedes.

The conspicuous absence of projectile points in the lithic and worked bone assemblages is also indicative of a slaughter pattern

different from that frequently employed by hunters when killing herd animals. There have been found, at Pincevent, a few bone point bases, but their state of preservation is such that it would be difficult to determine if, and in what capacity they were used (Leroi-Gourhan 1972).

It appears, then, that reindeer (at Pincevent) were slaughtered individually, on or near the camp site and probably at close range. They could have been killed individually and at close range by hunters using disguises or decoys, but to have been slaughtered on or near the camp site, they would have to have been habituated to some degree to human presence.

CONCLUSIONS

The data presented in this model are highly suggestive of a man/animal relationship involving domestication. Suggested is a form of domestication characterized by the minimal control and manipulation of reindeer behavior by man. The result of this manipulation was their habitation to human proximity which facilitated selective slaughter and which in turn assured the herd's success and maintenance as the prime resource of the human community. The interest shown by the occupants of the Paris Basin in the assurance of a healthy herd is evidenced by age curves of killed animals which strongly suggest selection for non essential, non reproductive individuals. That the reindeer had become habituated to man's presence is suggested by slaughter patterns, and further,(if not as positively),by the hypothesized duration of the sites' occupation and association between the animals and man.

Selective slaughter and habituation are features of incipient domestication; they reflect the interest in and control of animal behavior, which differentiate incipient domestication from specialized hunting. The latter may involve a certain amount of human interference in the lives of animals, but the element of control is absent. Since the domestication which appears to have occurred in the Paris Basin was almost surely preceded by specialized hunting, one might wonder what caused the change. This is an important question, and one which deserves

more attention than is possible to give at the current stage of research.

Several points may be considered relevant to the explanation of the hypothesized shift in subsistence activities from specialized hunting to incipient domestication. One emphasizes the importance of site location as a motivation for domestication. It may be going a bit far to claim strategic site location a prerequisite to domestication, as Jarman (1975) does, however, the development of a closer relationship would certainly be favored if the site location permitted or forced closer association of the animals with man. The sites of Etiolles, les Tarterêts, and Pincevent are thought to have been situated somewhere along what was a great North - South reindeer migration route during the Upper Paleolithic (Butzer 1971, Jarman 1975). The situation of Etiolles and les Tarterêts, near a ford which quite possibly existed as long ago as ten thousand years (Brard 1950) suggests that they were located near, if not actually in, the path of the reindeer (see figure 2). Pincevent may also have been as strategically located, but there is no evidence that a ford existed nearby. Riverbanks may have been "used" by the sites' inhabitants to observe movement of their herds; constant observation would have strengthened an already intimate knowledge of the animals' behavior and would have allowed the Magdalenians to recognize and take advantage of any potentially profitable situation (i.e. a situation in which control could be exercised over the animals). Childe (1951) and Watson and Watson (1966) place particular emphasis on the opportunity to observe and recognize potentially advantageous situations as conditions for the occurrence of domestication.

Under a certain set of circumstances, and given the opportunity to observe animals after an extended period of time, the reasonably intelligent man will "invent" domestication (Watson and Watson 1966). Whether or not this is generally true, it does not seem likely to have been the case in the Upper Paleolithic Paris Basin. As discussed in chapter I, domestication is not an invention and does not occur unless it offers a clear advantage as a means of subsistence. Reindeer hunting appears to have been a highly successful subsistence pattern in parts of Europe throughout most of the Upper Paleolithic, if not earlier (Butzer 1971). There is no evidence of environmental changes (such as Childe imagined) or any other conditions which would force man to invent another means of subsistence. Domestication probably did not occur in the Basin as a creation of man.

It may have simply evolved as a symbiotic relationship between two species - man and reindeer - which found close association to be mutually advantageous. The advantages for man of such an association are obvious. For reindeer, close association with human camp sites would afford protection from wolves, against which they are practically defenseless. The smoky fires of the Magdalenian camps would have repelled the flies and midges which severely plague reindeer in the summer. Protection from predators, midges, and the possibility of finding salt, urine, or other delicacies to eat could have made association with man extremely attractive for the reindeer.

It is not unreasonable to expect that the Magdalenians would have recognized the animals' willingness to associate, and could have capitalized on it. It is unlikely that the relationship ever developed to the

Lappish extreme, but it could well have been similar to the man/reindeer relationship which exists among the Chuckchi. Reindeer domestication does not, in fact, exist in much more complicated forms except among the Lapps. It usually has an "air of incompleteness" about it (Forde), as the domesticators must be as compliant as hunters with the reindeer's migratory habits.

Domestication, as a means of food production, can afford long-term security of resources which permits population expansion and encourages technological development and culture change. The nature of reindeer domestication would seem to check population growth, as large numbers of people could not afford to live the nomadic life necessitated by the reindeer's migratory drives. The correlation is interesting, however, between the disappearance of the Magdalenian culture near the end of the Upper Paleolithic, and the beginning of food production through animal domestication as suggested in this thesis. It awaits to be seen what part domestication played in the cultural revolution of the Mesolithic.

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