Domestication of Animals: Different Issues

One of the most fruitful and fascinating aspects of the evolution in human culture was the beginning of man’s relationship with plants and animals in the Mesolithic period that developed into domestication in the Neolithic (Prehistoric) period. It was through this process of domestication that a population of animals and plants first became accustomed to human care and control and then their evolutionary process was influenced by human so as to ensure secure supply of food and other valuable commodities like wool, hides, teeth, skin and silk. Other factors such as use of animals in transportation, protection, warfare, and companionship for enjoyment made the bondage more secure and strong. Thus the domestication of animals and plants proved harbinger to cultivation of crops and rearing of cattle and animals.

Simultaneously, with the advent of agriculture and animal husbandry, the role of hunting and foraging began to decline because now the domestic animals not only supplanted man’s need for food and clothing but also became source of energy for him. The ox, horse, buffalo, camel etc. provided not only meat and milk but also bones for making tools, skin for equipments, teeth for ornaments and hair for decoration and painting. These animals were also useful in carrying loads, drawing the ploughs, thrashing the crops, in running the Persian wheel and could be used as pack animals as well as for riding. This relationship between man and animals went beyond the utilitarian level even at the hunting stage as the man became emotionally attached with his domesticated animals. A
dog/wolf head found ceremonially buried in human graves at Burzahom, a Neolithic site in Kashmir bear evidence to this fact¹.

The domestication of animals probably began about 12,000 years ago and by about 10,000 years ago all human societies had learnt to domesticate plants and animals. This development proved to be of far reaching importance in human history as the groups which had learnt agriculture and animal husbandry were able to settle down permanently in villages. These villages slowly grew in size and developed into towns and cities, and around 5,000 to 3,000 years ago the first civilization development in the valleys of the Tigris-Euphrates, the Nile and the Indus took place.

**Meaning of Domestication:**

Domestication is a peculiar type of relationship between man and some species of animals. The use of these animals by man does not mean parasitism. Here he feels some sort of responsibility towards his herds or flocks under his control. This actually affords freedom for the development of his brain or mental faculties. A relationship between two animal species for their mutual benefit is known as parlance or symbiosis. Thus the domestication can be defined as a symbiosis between man and the domesticated animals.

A close man-animal relationship bordering on domestication necessitates the conservation of the herd, the preservation of its breeding members and the protection from loss by natural agencies. It simultaneously encourages the spread and proliferation of some animals at the expense of predators and other competing species. The domestication thus, is a broad and comprehensive term which though easy to understand is difficult to define.

Defining domestication of animal is a complex issue. The oxford dictionary describes domesticated animals as the ones which tend to remain under control. This approximately means a close relationship between man and animal and in general it is enough for conveying the idea. But for close analyses a precise definition is needed. To say that a domesticated animal is one which tend to remain under control include in that category tamed animals and zoo animals? A lion in a large case is under control but it cannot be called a domesticated animal.

Theories of Domestication:

Domestication began in different part of the world at different times, because the original species existed in different geographical areas. Any given wild species could, however, only have become domesticated in natural area of distribution. It may be assumed from this point that domestication of wild species is carried out when a certain level of culture is reached. Thus, the idea of domestication passed from one place to another.

S. Bökönyi has however, provided a definition which may be accepted as representative of a large body of archaeological option. He defines domestication as “the capture and taming by man of animals of a species with particular behavioral characteristics, their removal from their natural living area and breeding community, and their maintenance under controlled breeding condition for profit”.

S. Payne noted that the present zoological techniques are not capable of recognizing all such relationship and that even if they are at times recognized

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they represent only one aspect of the wide range of close man-animal relationship.

**E.S. Higgs and M.R. Jarman**⁴ while revealing the inadequacy of this definition note that to use the criteria of ‘control’ includes in the category tamed and zoo animals as well. A lion in a cage is under control but is not a domesticated animal, neither an animal such as badger that is a tamed can be termed as domestic animal. They believe that the distinctions between wild and domesticated animals are ill defined because each merges with the other by imperceptible gradations.

**Ducos**⁵ argues that man and animals are not partners. He believes that domestication is not a natural state; it exists, because humans wished it and not animal. Man domesticated animal for food purposes and in later period he realized their importance for agriculture, for traction and for carrying people and goods. Man also started exploiting animals for their secondary products like milk, wool, dung etc. According to Ducos⁶, domestication can be said to exist when living animals are integrated as objects into the socio-economic organization of the human group, in the sense that while living, those animals are object for ownership, inheritance, exchange and trade etc.

While giving his opinion on Ducos’s definition of domestication **Bökönyi**⁷ says that if domestication means integration of living with those animals as objects in socio-economic groups, one necessarily has to change to living condition of the animals by isolating them, corralling them, etc. Inheritance, exchange, trade etc. are consequences of domestication not components.

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⁶Ibid, pp.72-73.
Clutton-Brock’s\(^8\) definition of domestication is much closer to Bökényi’s definition. According to her a domesticated animal is one that has been bred in captivity for purposes of economic profit to a human community that maintains complete mastery over its breeding, organization of territory and food supply.

Zeuner\(^9\) Thinks that social interaction of keeping pet animals by women and children may have led to the process of domestication. He also calls this as mothering instinct. Actually this idea was put forth a century ago by Francis Galton 1863\(^{10}\). This may be true for the domestication of dog, but not a lesser extent in animals likes pig, cattle, etc.

Binford\(^{11}\) and Flannery\(^{12}\) suggest that the stress situation caused by demographic pressure may have been a stimulus for the process of domestication. Due to demographic pressure and decline in resources, people were forced to move out of the ‘optimal zones’ into the ‘marginal zones’, where situation similar to the former was created by acquiring plants and animal from the ‘optional zones’. Probably in due course of time this led to the domestication of plants and animals.

Higgs and Jarman prefer to confine the term domestication to later agricultural practices where intentional, selective, purposeful breeding could be demonstrated\(^{13}\). A close man-animal relationship converging on domestication necessitates the conservation of the herd, the preservation of its breeding members and the protection from and preservation of loss by natural agencies. It

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simultaneously encourages the spread and proliferation of some animals at the expense of predators.

**W. Herre**\(^\text{14}\) and many others suggest that man preferred the small sized animals because of their ability to sustain stress conditions better than the big ones. During scarcity they had a better chance of survival, with smaller food requirement, than the large ones.

As described by **Charles Darwin** the process of domestication can involve both unconscious and methodical elements. Routine human-animals interactions create selection pressures that cause adaptation as a result of which species adjust to human presence, use and cultivation. Deliberate selective breeding has also been used to create desired changes, often after initial domestication. Unconscious natural selection and methodical selective breeding are the two forces which played significant roles in the processes of domestication throughout history. Both have been described from man's perspective as processes of artificial selection\(^\text{15}\).

Mutation is not the only way in which natural and artificial selections operate. Darwin describes how natural variations in individual plants and animals also support the selection of new traits. It is speculated that tamed wolves are less wary of humans than the average wolves. These wolves were able to thrive by following humans to scavenge for food near camp fires and garbage dumps. Eventually a symbiotic relationship developed between people and these proto-dogs. The dogs fed on human food scraps, and humans found that dogs could warn them of approaching dangers, help with hunting, and act as pets, provide warmth, or supplement their food supply. Gradually this

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\(^{14}\)Herre, W., (1963), The Science and History of domestic Animals, D. Brothwell and E.S. Higgs (eds.), Science in Archaeology, pp. 235-249.

relationship intensified and humans eventually began to keep these self-tamed wolves and breed from them the types of dogs that we have today\textsuperscript{16}.

In recent times, selective breeding may best explain how continuing processes of domestication often work. Despite the success, it appears that selective breeding cannot always achieve domestication. Attempts to domesticate many kinds of wild animals have been unsuccessful. The zebra is one example. Despite the fact that four species of zebra can interbreed with and are part of the same. The factors which influence 'domesticatability' of large animals are discussed in some detail in Jared Diamond's *Guns, Germs, and Steel* (1999)\textsuperscript{17}. Surprisingly, in human history to date, only a few species of large animal have been domesticated. In approximate order of their earliest domestication these are: dog, sheep, goat, pig, cow, horse, donkey, water buffalo, llama, alpaca, Bactrian camel, Arabian camel, yak, reindeer, and elephant.

**Stages for the domestication of animals:**

P. K. Thomas\textsuperscript{18} suggests several stages for the domestication of animal. The first and the foremost are the loose contacts of man with animal with free breeding. The second stage is the confident with regard to human environment and breeding in captivity. In the third stage man made the selective breeding to obtain certain characteristics and occasional crossing with wild forms. In the fourth stage we can see the economic consideration of man leading to the planned development to breeds with certain desirable proportion. In the last fifth

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\textsuperscript{16} *Ibid.*
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\textsuperscript{18} Thomas, P. K., (1971), Domestication of Animal in Ancient India, *Dissertation* (Unpublished), to M.S. University, Baroda, pp.3-4.
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and final stage of domestication we can notice the persecution or complete extermination of wild ancestors.

**Conditions for domestication:**

According to evolutionary biologist Jared Diamond\(^{19}\), animal species must meet six criteria in order to be considered for domestication.

1. **Flexible diet** — Creatures that are willing to consume a wide variety of food sources and can live on food that is not utilized by humans, such as grass and forage, are less expensive to keep in captivity. Carnivores feed primarily or only on animal tissue, which costs lives of other animals, can be domesticated if they exploit sources of meat not utilized by humans, such as scraps and vermin.

2. **Reasonably fast growth rate** — Fast maturity rate compared to the human life span allows breeding intervention and makes the animal useful within an acceptable duration of caretaking. Large animals such as elephants require many years before they reach a useful size and hence prove costly to domesticate.

3. **Ability to be bred in captivity** — Creatures that are reluctant to breed in captivity are not suitable for domestication. It is better to capture them in their wild state. Creatures such as the panda, antelope and giant forest hog are territorial when breeding and cannot be maintained in crowded enclosures in captivity.

4. **Pleasant disposition** — Large creatures that are aggressive toward humans are dangerous in captivity. The African buffalo has an unpredictable nature and is highly dangerous to. However one must keep

in mind that most modern large domestic animals were descendants of extremely aggressive ancestors as horse, Bactrian camels and yaks, etc; all of which were extremely dangerous in their wild state.

5. Temperament which makes it unlikely to panic — Creature with a nervous disposition is difficult to keep in captivity as it may attempt to flee whenever startled. The gazelle is very flighty and it has a powerful leap that allows it to escape an enclosed pen. Some animals, such as the domestic sheep, still have a strong tendency to panic when their flight zone is encroached upon. However, most sheep also show a flocking instinct, whereby they stay close together when pressed. Livestock with such an instinct are herded by people and dogs.

6. Modifiable social hierarchy — Social creatures that recognize a hierarchy of dominance can be raised to recognize a human as the pack leader.

However, domestication causes profound changes in a species. It is true that some animals, including parrots, whales, and most members of the carnivora, retain their wild instincts even if born in captivity; some factors must be taken into consideration. In particular, wild animals are naturally timid and flighty because they are constantly faced by predators; domestic animals do not need such a nervous disposition, because they are protected by their human owners. The same holds true that aggressive temperament is an adaptation to the danger from predators. A Cape buffalo can kill even an attacking lion. Domestication alters a species: Dispersal mechanisms tend to disappear for the reason stated above and also because people provide transportation for them. Chickens have practically lost their ability to fly. Similarly, domestic animals cease to have a definite mating season, and so the need to be territorial when
mating loses its value. The process of domestication can itself make a creature domesticable.

**Domestication of animals in world context:**

The beginning of the domestication of animals established a new relationship between man and animals, which, over a certain period, introduced, on the one hand changes in domesticated species which took new morphological characteristics and on the other hand an evolution of human culture in which new ways of life were adopted as a response to the success in gaining control of a part of the essential meat supply. In order to assess objectively the beginning of domestication, it is necessary to concentrate on this very relationship; it is clear that anatomical features cannot reveal the beginning of domestication because domesticated species undergo transformation only after a considerable number of generations. At the same time, indirect archaeological evidence (equipment, architecture, a sedentary existence) is not sufficient to actually prove primitive domestication\(^{20}\).

The beginning of cultivation and domestication of plants and animals started in south western Asia than elsewhere\(^{21}\). The transition from food gathering to food producing took place in the southern alluvial plain of Mesopotamia, the low hill at the foot of the Zagros and Taurus mountains, the valleys of those mountains, the high plateau of Turkey and the coastal area and the low hills of the eastern Mediterranean\(^{22}\).

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\(^{22}\) Clason, A T., (1979), *Wild and Domestic Animal in Prehistoric and Early Historic India*, Lucknow.
Table 2.1 shows the period and area of domestication of animals in world context\textsuperscript{23}.

<table>
<thead>
<tr>
<th>Species</th>
<th>When (years in B.C.)</th>
<th>Where</th>
<th>Why</th>
<th>How</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dog</td>
<td>18,000-10,000</td>
<td>East Africa</td>
<td>Pet, companion</td>
<td>Wolf or jackal</td>
</tr>
<tr>
<td>Goat</td>
<td>9,000-8,000</td>
<td>Iran</td>
<td>Food, milk and clothing</td>
<td>Wild goat</td>
</tr>
<tr>
<td>Pig</td>
<td>9,000-8,000</td>
<td>China</td>
<td>Food and sport food, milk and clothing</td>
<td>Wild boar</td>
</tr>
<tr>
<td>Sheep</td>
<td>10,000-8,000</td>
<td>Southwest Asia</td>
<td>Food, milk, wool and clothing</td>
<td>Mouflon and Asiatic urial</td>
</tr>
<tr>
<td>Cattle</td>
<td>8,000-7,500</td>
<td>India, Middle-east, Sub Saharan Africa</td>
<td>Agriculture purpose, meat, milk, leather, and religious reasons</td>
<td>Auroach</td>
</tr>
<tr>
<td>Chickens</td>
<td>5,000-4,500</td>
<td>India, Sumatra and Java</td>
<td>Meat, eggs, feathers</td>
<td>?</td>
</tr>
<tr>
<td>Horse</td>
<td>4,000-3,500</td>
<td>Eurasian Steppes</td>
<td>Transportation, meat</td>
<td>Wild horse</td>
</tr>
<tr>
<td>Ass</td>
<td>4,500-4,000</td>
<td>Egypt</td>
<td>Transportation, meat</td>
<td>Onager or Khur</td>
</tr>
<tr>
<td>Buffalo</td>
<td>3,500-3,000</td>
<td>India, China</td>
<td>Milk, meat</td>
<td>Wild Buffalo</td>
</tr>
<tr>
<td>Camel</td>
<td>4,000-3,500</td>
<td>Iran and Turkmenistan</td>
<td>Agriculture purpose and transportation</td>
<td>Wild Camel</td>
</tr>
<tr>
<td>Elephant</td>
<td>2,500-2,200</td>
<td>India</td>
<td>Transportation</td>
<td>Wild elephant</td>
</tr>
</tbody>
</table>

What is probably the earliest evidence to date of domesticated animals in south west Asia comes from the site of Mehrgarh\textsuperscript{24} situated on the north Kachi plain at

\textsuperscript{23} http://archaeology.about.com/ Guide to the History of Animal Domestication.
the foot of the Bolan Pass in the zone of transition between the Iranian Plateau and the Indus alluvium. The wild animal remains that dominate the earliest levels of “aceramic Neolithic” period IA reflects this situation with 12 forms of “big game” represented: wild sheep (*Ovis orientallis*) and goat (*Capra aegagrus*) from the hills, gazella (*Gazella bennetti*) from the foothills and plains, will asses (*Equus hemionus*) and blackbuck (*Antelope cervicapra*) from the drier plains, and nilgai (*Boselaphus tragocamelus*), large deer (*Cervus (?) duvauceli*), smaller deer (*Axis (?) axis*), boar (*Sus scrofa*), water buffalo (*Bubalus arnee*) wild cattle (*Bos primigenius* or *Bos namadicus*), and possibly elephant (*Elaphas maximus*) from better watered areas.

The wild sheep, goat, cattle and buffalo all comprise potential ancestral stock for the domestic form. To judge from the occurrence of live kinds in each of two burials, however, goats are likely to have been domesticated already in the first level of period IA dating to the early seventh or late eighth millennium. The domestic status of at least some of the goats is confirmed by the presence of the remains of relatively small sub-adult or adult animal in contemporary trash deposits. A decrease in body size of the grown or nearly grown animal is one characteristics of early domestic bovid for sheep and goat, Grigson for cattle. Goats are also the single most common animal after gazelle.

Wild goats (*Capra aegagrus*) appear to have inhabited the craggy terrain of the Levant through the late Pleistocene and early Holocene. Bones are known

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26Uerpmann, H. P., (1979), *Problem der Neolithisierung des Mittelmeerraums* [Beiheften zum Tübinger Atlas des Vorderen Orients, Reihe B (Geisteswissens chaften) 281]. Weisbaden: Dr. L Reichert.
from epic Paleolithic and a ceramic Neolithic site in Lebanon, Syria, Jordan and Israel as far south as Beidha near Petra.\textsuperscript{28}

The earliest strong evidence for goat management in southwest Asia comes from levels dates to 7000 B.C. at Ganj Doreh in western Iran. A dramatic swing from gazelle to goat in the middle Pre-Pottery Neolithic B at Jericho in the Jordan Valley (7200-6500 B.C.) and the finding of a high incidence of foot pathology in goat from the same period at ‘Ain Ghazal near Amman, does however hint strongly at herd management.\textsuperscript{29} Further north, at Tell Abu Hureyra on the Euphrates, there was a dramatic shift from gazelle to goat sheep exploitation at about 6300 B.C.\textsuperscript{30}, although Legge argues that domestic goats were present there from early in the Pre Pottery Neolithic Period. They have also been found at contemporary site in southern Jorden the Negev and as far north as Hatoula and Jericho in central Israel.\textsuperscript{31}

Explanations for the beginning of animal domestication have been broad and varied. Appreciating that the earliest domestic animals appeared to have been kept by agriculturists, Flannery\textsuperscript{32} noted that domestic animals provided a “walking larder” and security against crop failure. They were also available for exchange. It will do good to remember that animal domestication like plant cultivation is a cultural choice, a choice of adaptation strategy, which was gradually resorted to and actualized at different time in different regions.

\textsuperscript{28}Uerpmann, H.P., (1987), The ancient distribution of ungulate mammals in the Middle East [Beiheften zum Tübinger Atlas des Vorderen Orients, Reihe A (Naturwissenschaften) 27]. Weisbaden: Dr. L Reichert.
\textsuperscript{29}Clutton, B. J., (1979), The mammalian remains from the Jericho-Tell., Proceeding of Prehistoric Society, 45, pp. 135-158.
The first evidence of a domestic animal, a dog, is dated between 14,000 and 12,000 years ago and the earliest known domestic food animals were sheep somewhat less than 10,000 years ago\(^{33}\).

Probably taming, and then domestication, occurred without people having been aware of what was happening. Certainly, gatherers and hunters – the people who first domesticated animals – could not have foreseen any uses for those animals other than those they knew already: for meat, bones and skins. Only later, after long experience and the intensification of a more sedentary lifestyle, and after the accumulation of random mutations in the domesticates, would secondary uses of animals – such as for milk, wool, motive power, war, sport, and prestige – be realized\(^{34}\).

Zeuner’s\(^{35}\) suggestions that domestication came as a relatively sudden occurrence, limited only to the last few millennia of human history and suggest that to talk of the origins of domestication would be misleading, if by this one means a well defined stage or point at which a fully new type of economic relationship emerged. Man–animal relationships similar to domestication, Zeuner believe, must have occurred in the Pleistocene, whenever this was ‘the most profitable economic strategy’ in the existing circumstances\(^{36}\).

Domestication of animals is an ongoing process and many animals have been domesticated more than once as occasion demanded.

When one considers that hominids had been hunters and consumers of animals for millions of years, the behavioral change required for them to become keepers and conservers of animals was a major cultural revolution.


Some major cultural change must have occurred that the life style of millions of years would be abandoned.

In the first place, such cultural change did not occur until after the evolution of anatomically modern (post – Neanderthal) human and even then not for almost 30,000 years, so the mere emergences of the people like ourselves did not automatically result in domestication. The second main factor may have been the world-wide changes in environment that accompanied and followed the end of the last glacial period. The earth became warmer, and the continental ice sheets began to melt back, extremely slowly at first, some 14,000 years ago. Soon after this we find the first evidence of dogs, south western Asia.

**The Period of domestication in India:**

The history of domestication of animals in India goes as far back as 7000-6000 years B.C. from the Mesolithic cultural phases at site Bagor, Bhilwara district in Rajasthan\(^{37}\) and site Adamgarh, Hoshangabad district in central India\(^{38}\). At Bagor, sheep/goat has been identified as the principal domestic animals\(^{39}\), while at Adamgarh, cattle (*Bos indicus*), buffalo (*Bublus bublis*), sheep (*Ovis aries*), goat (*Capra hircus*), pig (*Sus domesticus*), and ass (*Equus asinus*) are reported as domestic animals\(^{40}\).

Alur’s\(^{41}\) analysis provides convincing evidence of the operation of the law of natural relation and the adaptation of these species to the changing ecological conditions leading to the emergence of such wild species (or potential

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domesticates) in the Mesolithic as were amenable to domestication in the succeeding Neolithic. The sheep/goats are found in fully domestication from in the Neolithic sites at Koldihwa and Mahagara. Normally animal domestication in India has been explained by the gradual expansion of the Neolithic system from west Asian nuclear area. But, in the light of the above mentioned facts it becomes difficult to accept that animal domestication in India was a product of foreign influence, especially of west Asiatic origins.

The beginnings of domestication in Indian subcontinent on present evidence can be traced to the Mesolithic period. However, excavations have often been too small and bone collections inadequate or the report merely catalogues with little or no bearing on the history of domestication. In fact since the work of Sewell & Guha and Prashad no attempt has been made to study the problem of domestication of animals in the light of the new faunal evidence that has accumulated as a result of recent excavations.

**Differences between wild and domestic animals:**

The early man discovered that there were certain advantages in conserving certain animals near to his dwelling place and he entered into the first phase of domesticating them. At this juncture, the only sign of domestication available to the archaeologist was ecological. However, there were frequently too small amounts of material available to determine if animal remains found in association with man represented a random sample of a wild living population or one drawn from a “domesticated” population.

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The wild animals have undergone considerable changes during the course of domestication and the man had developed different specialties in them. Domestic animals occur in more varied form than wild species. The changes that occurred during domestication may be regarded as morphological development within the species. As a result of domestication there was a change in the size, colour, anatomy and even on the soft tissues of the animals\textsuperscript{47}. The changes that had occurred during the course of domestication are briefly described herein.

**Size:** - In general the size of the early domesticated animal was smaller than their wild ancestors. This can be explained by most dogs, cats, cattle, sheep, goats, pigs and others. In prehistoric times smaller size in the domesticated species is very well known. But there are some exceptions also. For example the camel both of the old world (\textit{Dromedary, bactrian}) and of the New world (Guanaco, vicuna) are almost the same in body size as their wild relatives. On the other hand, some mammals have developed a tendency to grow larger in size under condition of domestication such as the rabbit, and the horse, the sheep and the goats generally there is comparatively little variation in size that has developed giant and dwarf species\textsuperscript{48}.

**Colour:** - The most important characteristic feature of domesticated animals is, often, their colouration. In the single humped camel and two humped camel, light white colour is by far the commonest but dark coloured ‘black’ and very light coloured ‘white’ specimens are found often highly valued. The white elephants are rare and this colour is hardly due to domestication. Since elephant are not normally breed under controlled conditions.

\textsuperscript{47}Zeuner, F. E., (1963), \textit{Op. Cit.}, pp.36-64.
In most of the other domesticated animal wild colouration is the exception. It is not completely absent in any of them and is usually preserved in particular breeds. Among horses white colour is very exceptional namely the yellow-dun of the Mongolian wild horse and the mouse-grey of the tarpon. It appears that the reddish brown shade has always been popular and hence selected for preference by man. In cattle the white colour is retained in some breed of south-west Europe and northwest Africa. The buffs are usually blackish with a cream coloured stripe on the back and a patch on the forehead. The plain red or reddish brown is so common among cattle is due to the retention of juvenile colouration.\textsuperscript{49}

\textbf{Change in the skull:} - Change in the skull the most important mainly and there can be easily recognizable in fossil material from ancient dwelling sites. The facial part of the skull tends to be shortened relative to the cranial which is but little affected. It is virtually absent in horses and asses and also in camels. This change is very conspicuous in pig, where the shortening of the face is extremely pronounced and connected with an upward bend of the plane of the palate in relation to the plane of the occipital. A similar condition is an observed in dog like the bull dog, the boxer and the Pekinese. The same changes can be noticed in cattle, sheep and goat and even in cat also. These changes are also co-related with the changes in size of the brain care for Liam.\textsuperscript{50}

Dentition is also affected by the changes in the proportions of the skull. Teeth became smaller in the domesticated species than their wild ancestors. For example in dogs the 4\textsuperscript{th} pre-molar of the upper jaw and the first molar of the lower jaw which together forms the bone cutting pincers so characteristic of

\textsuperscript{49} \textit{Ibid}, pp. 52-53.

carnivores are smaller than in the European wolves from which these are domesticated.

The *Canis familiar* that has been found from Mohenjodaro shows particular differences. The fragments of lower jaw shows clear points of difference from the wild dog in that the coronoid process of the jaw springs at an oblique angle from the horizontal ramous instead of being almost at right angles to it as in the case of wild dog\(^5^1\).

Very considerable changes occur in the skull of the species which have horns in the wild condition. In general we can say that domestication tends to reduce the size of horn as exemplified by the small horn of prehistoric cattle of the brachycome breed and the sheep and goat of Neolithic lake-dwellings. Domesticated Buffalo also have smaller horns than the wild species. In sheep and goats the size of the horns varies more. The horn may be rolled up into a more or less close spiral and even straight twisted horns occur in certain breeds. That such variation is basically present in the group is amply shown by the wild races and species such as Markhor goat of India\(^5^2\).

**Changes in the skeleton of the body and limbs:** - In domesticated cattle however weak muscle-ridges and poorly defined facets of the joints makes it comparatively easy to recognize specimens of domesticated origin and also in the domesticated pig. Where the epiphysis of the limb bones do not fuse with the diaphyses until long after maturity is reached and the same applies to the sutures of the skull. The number of caudal vertebrae is almost invariably reduced in domesticated forms, expect in sheep where an “increase in the number of tail vertebrae beyond twelve is virtually certain character of domestication\(^5^3\). The


bones of the limbs are very considerably in domesticated breeds. They may be longer but are usually shorter than in the wild form. The limbs of bull and dachshunds are the most important examples\textsuperscript{54}.

**Hair:** - Instead of all these changes some modifications occur in the soft part of the body of these the most striking are those of the length and texture of the hair and skin.

The great changes can be noticed in the dog as regard to the hair. There is not much change in the cattle. In the mane and tail of the horse we can notice the lengthening of hair. In some domesticated breeds hairlessness can be noticed. The most obvious example of this kind is the pig. The wool producing sheep and goats are selected by the wool producers\textsuperscript{55}.

**Soft Parts:** - The skin itself is frequently modified as a result of domestication; it tends to become flabby. The characteristic feature of dewlaps and skin folds of the young animal are preserved by the adults. The obvious example is seen in certain breeds of dogs\textsuperscript{56}.

The brain is also affected by domestication, the size of brain relative to the rest of the body may be reduced, and some part being affected more than others; musculature may be increased (as in draught or racing horses) or reduced (as with chewing muscles of carnivores)\textsuperscript{57}. The length of the digestive track is also increased considerably in domesticated carnivores. The best example is the dog and cat.

\textsuperscript{55}Ibid.  
\textsuperscript{57}Ibid.
**Some general consideration:** - In domestication we can see the pathological characters are often favoured and the withdrawal of animals from natural selection makes it possible to develop such characters in domesticated breed especially when the breeding communities are small. The growth sates of organism are affected by domestication. The growth rate of or ganism are effected by domestication. The growth is not the same as in the wild species. The head of the cattle are on the whole smaller in proportion to the body than they were in the aurochs. Many other modifications are due to changes in physiological equilibrium of the species. In dealing with these changes inform we are also in fact looking for differences between domesticated and wild animals. Such controversies still exist in this problem. Anyhow the more reliable matter is discussed by Zeuner\(^58\).

Climate has played a major role in shaping the human culture and domestication of plants and animals is also effected by that. When the climate changed during the Holocene climate there appeared vast *Swanna* lands. This led to the changes the changes in the animals and now most of the animals had to adapt to this. The grass animals’ viz. sheep, goat and cattle population increased. The man exploited this situation to his favour and there started domestication of plants and animals. This domestication did not abruptly start. Firstly man started keeping and protecting these animals near him and similarly started protecting plants. When he deliberately starting breeding animals this is called domestication and similarly when man deliberately put the grains in the soil agriculture started.

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