The state revenue from sheep is indicated in the following regulation : The king should have one-eighth of the increase of sheep,[1] and one-sixteenth of the milk of the female animals. The rule is thus exactly the same as in the case of goats.

iii. Cervidæ.

The Cervidæ or Deer-Family is celebrated in Indian classical poetry. The elongated eyes of the animal are the touchstone of beauty in visual organs, according to the æsthetic sense of damsels idealisd by Hindu poets. The animal is also appreciated for its gentle and tame disposition, and is the invariable stock-in-trade of authors for describing peaceful hermitages of ascetics and saints. The deer is known to be very fond of music. In Rajput school of painting, the deer is the conventional symbol[2] for one of the tunes or Râgiṇîs, called the *Tori*. Sukrâchâryya, in describing the *Viṣayas* or things of enjoyment which overpower the character of human beings, refers to the effects of delightful sound even upon lower creatures : "The deer,[3] which is innocent, feeds upon grass and blades and can roam far and wide, seeks death attracted by the music of the tempter." This fondness of the deer for music has been again referred to in connexion with statecraft. "One should always do good of those whom one intends to ruin. The fowler sings sweet in order to entice and kill the deer."[4]

The Department of Live-stock should make provision for stabling the animals. The following rule about deer applies equally to goats, sheep, &c. : " Houses should be built towards the west for cows, deer,[5] camels, elephants and other animals." The rule for the appointment of men in charge of animals is the same in all cases. We are told that each species should have a separate staff of officers : "The king should appoint separately the heads of elephants, horses, chariots, infantry, cattle, camels, deer,[6] birds, gold, jewels," &c. The qualifications of such men have been already noted in connexion with goats and sheep. The leaping of the deer is well-known and supplies the technical term for a pace of horses : "The pluta movement is that in which the horse leaps with all the four legs like the deer."[7]

The prices of deer have not been noticed, nor also the revenue derived from them.

iv. Suidæ.

The Suidæ or Boar-Family has supplied an avatâra or incarnation of Viṣṇu, as we have previously noticed, in Hindu mythology. In the *Sukranîti* we do not read much of it. The tradition is recorded that one of the sources of pearls is the hog.[8]

[1] Sukra IV,ii ,289-40.
[2] See Coomâraswâmy's *Selected Examples of Indian Art.*
[3] Sukra I, 203-4. See also III, 33-34.
[4] Sukra V, 62-63.
[5] Sukra I, 450.
[6] Sukra II, 287-288.
[7] Sukra IV, vii, 294.
[8] Sukra IV, ii, 117-18.

(e) *Cetacea.*

The whale is known to be an aquatic animal. It is symbolical of huge size. Sukrâchâryya teaches man humility by the following illustration: "One should remember that there is the animal which devours the devourer of whales,[1] Râghava is the devourer of that even, and there is the destroyer of Râghava." So the rule[2] is that the wise man should never consider "I am superior to all, I am more learned than others."

Section 6.

Aves in Sukranîti.

Birds[3] are mentioned along with the cattle and other animals as some of the attractions of the place where the capital city is to be built. The economic importance of this department of Fauna is further shown in *Sukranîti* by the provision for the appointment of a special staff to look after the birds[4] maintained by the state. Some of the battle-orders in which troops are enjoined to be arrayed indicate careful observations of the limbs of the aves and their habits, &c.

(a) *Passeres.*

Passeres[5] constitute more than half of the Birds of India; but only one family of this order has been mentioned in Sukranîti, *e.g.*, the Eulabetidæ. The bird gackle, talking mainâ or hill mainâ which belongs to this family is to be used in the examination of royal food. The toxicological principle is the fact that the bird begins vomiting at the very sight of poisoned food.[6]

(b) *Coccyges.*

The cuckoos belong to the Cuculidæ Family of this order. The shout of the bird is traditionally known to be sweet and has been much poetised both in the east and west. In advising people to learn restraint and gentleness in speech, Sukrâchâryya remarks that "the voices of the drake red with passion, the cuckoo[7] and the peacock are not so attractive as those of the good and the wise." It requires to be noted here that poets have not bestowed much attention on the talking mainâ which has the wonderful power of imitating human voice.

(c) *Psittaci.*

To this order belong the parrots, which can be made to acquire human voice like hill mainâs. Among the qualifications of persons to be appointed to the Department of Live-stock, one is the ability to teach parrots,[8] (and birds

[1] Sukra III, 446-47.
[2] Sukra III, 444-45.
[3] Sukra I, 425-28.
[4] Sukra II, 237-38.
[5] Indian Empire, Vol. I, p. 239, in *Imperial Gazetteer.*
[6] Sukra I, 654-57.
[7] Sukra I, 337-38.
[8] Sukra II, 300-02.

generally). Sukrâcharyya refers again to the educability of these birds in the following lines :

"The elephant, the horse, the ox, the child, the wife and the parrot[1] get the qualities of their teachers through association."

(*d*) *Accipitres.*

To this order belong the Indian birds of prey. The Syena or hawk is the only bird mentioned in Sukranîti that may be placed in one of the families of this very great order. One of the qualifications of men to be appointed in charge of birds and animals is the knowledge and skill of catching hawks[2] by appropriate enticements. They must know when such birds fall victims to arrows. This bird has supplied a technical term to military science. One of the forms of battle array is known to be the syena or hawk-order or order with two wings. The soldiers are to be arrayed in this form when the enemy is known to have placed danger ahead,[3] *i.e*, when the army has to encounter a front attack. It is the order in which the wings[4] are large, the throat and tail medium, and the mouth small.

(*e*) *Columbæ.*

Pigeons or Treroninæ are common Indian birds belonging to the Columbæ order. This bird also has supplied the form of a battle order called after it the *Krauncha Vyuha*[5] or Pigeon array. It is to be formed according to the nature of the region and the troops in the same rows as the movements of pigeons in the sky. It is that order in which the neck is thin, the tail medium and the wings thick.

(*f*) *Gallinæ.*

This order comprises the common Game Birds of India, *e.g.*, pea-fowls, jungle-fowls, pheasants, partridges, quails, &c. This order is well-represented in Sukranîti.

The peacock's divided note is called *keka* in Indian literature, and the bird itself is held sacred *e.g.* by several ruling dynasties. It is the *vâhana* of the war-god *Kârtikeya*. Sukra authors, as we have seen above, have recorded the tradition about its voice. "The man who is popular speaks sweet words like the notes of the peacock."[6] "But the voice of the peacock is not so sweet as that of the good and the wise. So one should use pleasant words both to good men and enemies. The sensitiveness of peacocks to poisons is a test to be utilised in the examination of royal food; for at the sight of poisons, toxicologists say, peacocks begin to dance.[7] The feathers[8] of the bird are known to the Sukra authors as possessing bright lustre ofemerald or pâchi. Its long neck has also been observed. The gait of the horse is called *valgita*.

[1] Sukra III, 582-583.
[2] Sukra II, 300-302.
[3] Sukra IV, vii, 527-28.
[4] Sukra IV, vii, 559.
[5] Sukra IV, vii, 556-58.
[6] Sukra I, 385-88.
[7] Sukra I, 654-57.
[8] Sukra IV, ii, 87.

when it runs with contracted legs, neck raised like that of the peacock[1] and half the body trembling.

The jungle-fowl or the cock[2] is known to cry at the very sight of poison. This supplies a test to the medical officers superintending the royal kitchen.

The *tittira* or partridge has been referred to only once. It is stated that the men in charge of birds should be competent enough, among other things, to domesticate the partridges.[3]

(*g*) *Grallæ.*

The Gruidæ or Crane-Family is one of the many families belonging to this order that has been mentioned in Sukranīti. Cranes get intoxicated[4] at the sight of poisons. Hence, their utility to men and especially to princes who should always have their food examined before meals.

(*h*) *Anserees.*

Ducks belong to this order. These birds begin to limp[5] at the very sight of poisons. This sensitiveness is to be utilised by the medical men of the palace. Drakes or Swans or Ganders are also famous in Indian poetry as emblematic of passionate love. Their notes are known to be sweet like those of the cuckoo and the peacock. Thus we have the advice regarding cultivation of restraint and gentleness in speech : "The voices of the drake[6] red with passion, the cuckoo, and peacock are not so attractive as those of the good and the wise."

SECTION 7.

Reptiles in Sukranīti.

According to the *Fauna of British India* (1890-1900) there are altogether 153 genera containing 558 species of reptiles in India. These belong to three orders: (1) *Emydosauria* or Crocodiles ; (2) *Chelonia* or Tortoises and Turtles and (3) *Squamata* or Lizards and Snakes.

"The Reptiles of India[7] are far more numerous than mammals and more destructive to human life ; snake-bites alone cause more deaths than all the wild beasts together."

It is not strange, therefore, that Reptiles should have made a deep impression on the life, habits and thought or literature and art of the people of India in ancient and mediæval times. Sukranīti is full of references to reptiles, especially to snakes, indicating the great familiarity of the authors and their countrymen with these species of Fauna, whether they willed it or no.

(*a*) *Emydosauria.*

The *makara* or alligator is a very familiar river animal. It has left its influence on Hindu religion, art and industry. It is sacred to the goddess Gangā, one of the national rivers of the Hindus. The goldsmiths and jewellers

[1] Sukra IV, vii, 297-98.
[2] Sukra I, 654-57.
[3] Sukra II, 297-298.
[4] Sukra I, 657-57.
[5] *Ibid.*
[6] Sukra I, 337-338.
[7] *Imperial Gazetteer of India*—Indian Empire, Vol. I, Chap. V, Zoology.

manufacture the alligator pattern of ornaments and decorative devices much appreciated by connoisseurs. The national taste of the people also finds satisfaction in the alligator shapes perpetuated in sculpture and painting.

Nor is this all. This family of reptiles has contributed a technique to military science or *Dhanurveda*. Thus, according to *Sukraniti*, one of the recognised Battle-orders is the alligator array[1] in which the commander should arrange his troops when he has to face an opposition in the front. This *vyuha* or array[2] is described as that form which has four legs, long and thick mouth and two lips. There is no doubt that the formation is based on a correct observation of the external organs of the animal.

(*b*) *Chelonia.*

Tortoises are sacred to the goddess Yamunā, another holy river of the Hindus in upper India. Like the Boar, this species of Fauna has contributed an avatāra, or one of the 10 divine incarnations, to Hindu mythology. The animal has been referred to only once in a passage that describes at once its physique as well as an important feature of the material civilisation of ancient India. The Sukra ideal of road-making is given in the following line: "The roads are to be made like the back of a tortoise[3] (*i.e.*, high in the middle), and should be provided with drains on both sides for the passage of water."

Tortoise[4] shells seem to have been some of the articles of trade in the early Christian era. The *Periplus* records that from the port of Muziris on the Arabian coast, famous also in Tamil classics, the list of exports included among other things "tortoise shell from the golden Chersonese or from the islands off the coast of Limurike."

(*c*) *Squamata.*

The dangerous character of snakes is too well-known. But bad men are more dangerous than they. The advice, therefore, is that "one should associate rather with snakes[5] whose mouths contain poison and whose faces have been darkened by the smoke of fire exhaled by their breathings, but never with bad men."

Like the tiger, the snake is also emblemical of fury and vehemence. One of the attributes of the king is fury and prowess. He is therefore naturally compared with a snake,[6] and officers are advised to approach him with caution.

The snake is never to be pitied or neglected. "The snake,[7] the fire, the wicked man, the king, the son-in-law, the nephew, the disease, and the enemy —these are not to be regarded as being too small." Expeditions against snakes[8] must, therefore, have been common. The advice is "one should not go alone to attack snakes, tigers and thieves"

Another reference to dangerous things includes snakes also. "Association

[1] Sukra IV, vii, 527, 528.
[2] Sukra IV, vii, 560.
[3] Sukra I, 531-32.
[4] Aiyangar—Ancient India, p. 65.
[5] Sukra I, 327-28.
[6] Sukra 430-31
[7] Sukra III, 212-13.
[8] Sukra III, 328.

with tiger, fire, snake[1] and other ferocious animals is not good. Even when served, the king and these things can never be friends to anybody."

Snake-charming[2] was practised, as even now. The power of the snake-charmer over the snake supplies a very characteristic analogy : "The minister masters the king by the force of mantra (charm or counsels), just as the snake-charmer subdues the snake."

Of the above extracts, four come from a single chapter, that on the general rules of morality. As all the references are but casual, they indicate the enormous impression made by venomous snakes on the general thought of the people.

The same topic about the natural or ingrained maleficence of snakes is harped on in the following verses : "Instructions to foolish people are the causes of their anger, not pleasure; just as the drinking of water by snakes[3] is for the making of poison, not of nectar."

Sukra authors have recorded the tradition of gems being borne on the heads of snakes. "The gem on the head of the snake[4] is the best of all, of very great splendour, but very rare. Snakes[5] are also said to constitute one of the sources of pearls. The real explanation of the popular idea has been given in the chapter on mineralogy The snakes have to pick up bright stones in their mouths when they move about in the dark. These stones are their lamps, so to speak, and serve the purpose of pointing out their paths.

The snake has contributed one battle-formation named after itself. The vyâla or snake array[6] should be devised by the commander when the danger is on all sides. It looks like the snake.[7]

Further references to snakes are given below :—

(1) As an ordeal or *divya* : The accused has to swallow poison or catch the poisonous snake[8] by the hand ; and if he gets scot free, his innocence is proved ; otherwise not.

(2) The earth swallows the king who does not fight, and the Brahman who does not go abroad, just as the snake[9] swallows the animals living in the holes.

(3) One should keep five cubits from the carriage, ten cubits from the horse, one hundred cubits from the snake,[10] and ten cubits from the bull.

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[1] Sukra III, 518-19.
[2] Sukra III, 561-62.
[3] Sukra IV, i, 37-38.
[4] Sukra IV, ii, 96.
[5] Sukra IV, ii, 117-118.
[6] Sukra IV, vii, 529-31.
[7] Sukra IV, vii, 565.
[8] Sukra IV, v, 478.
[9] Sukra IV, vii, 604-5.
[10] Sukra III, 281-2.

Section 8.

Pisces in Sukraniti.

Fishes and Fish life are well-known to Sukra authors. Fishing and angling must have been familiar practices. Thus one of the illustrations in Sukranīti about the bad effects of the inclination to satisfy the sense of taste, one of the classical *vyasanas* or vices, is drawn from angling: "The fish,[1] though it dives into unfathomed depths and lives in distant abodes, tastes the angle with meat for death" The fish is thus the object lesson for the danger from *rasa* or taste. This fact has been recorded again: "The deer, the elephant, the fly, the bee, and the fish[2]—these five are ruined through sound, touch, form, smell and taste respectively."

Fish-eating[3] is also known; but it is described as a local custom confined to *madhyadesa*. The limits of the country indicated by it have been discussed in the chapter on Geography. It has been suggested that the ideal advocated or 'norm' represented by the Sukra authors is one of vegetarianism, fish-eating being something abnormal. It has to be noted that in Sukranīti there is no mention of fishermen as a class,[4] fishing as a kalā, or realisation of revenue from that industry. It may be surmised that it is not one of the state-recognised occupations of the country according to Sukranīti, the people among whom or for whom it was compiled being generally abstemious in the matter of fish and meat diet.

Fishes are known to be sources of pearls.[5]

Like the tiger, the fish also supplied an emblem of kings. In the Tamil classic, Epic of the Anklet, (2nd cent. A.D.) "there are a number of references throughout the work to the erecting of the fish-emblem[6] on the Himalayas. * * * These achievements are clearly ascribed to the reigning Pandyan in Canto xvii."

Section 9.

Invertebrates in Sukranīti.

Sukranīti is not so rich in observations regarding habits, habitats and organs, &c., of invertebrates as of vertebrates, especially Aves and Reptiles.

Conches belonging to the *Mollusca* class of Invertebrates are very important in Hindu religious ceremonies. The notes produced by blowing the shells of these molluscs with the mouth are integral features associated with auspicious and purificatory occasions. In Sukranīti these are mentioned together with drums, trumpets, pipes &c., as ware-paraphernalia to indicate by their sounds, like bugles, the construction of battle-arrays.[7] They are also known to be the sources of pearls,[8] like snakes, fishes, &c. Their colour is

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[1] Sukra I, 209-210.
[2] Sukra III, 33-34.
[3] Sukra IV, v, 95-96.
[4] Sukra II, 390-411.
[5] Sukra IV, ii, 117-118.
[6] Aiyangar's *Ancient India*. p. 356.
[7] Sukra II, 402-3.
[8] Sukra IV, ii, 117-118.

characteristic. The teeth of horses[1] acquire this colour from the twenty-first year.

Varâtis or cowries are also smaller species of the same order important in Indian economic life as a form of what is technically called "money." These are the lowest coins for the standard of value and medium of exchange. They are mentioned in Sukranîti only in connection with currency,[2] as indicating its unit.

A third species, belonging to the Mollusca, mentioned in Sukranîti, is known to be the most prolific source of pearls. It is the oyster-shells[3] It is the pearls derived from these shells that are used in ornaments, for these alone can be bored or pierced.[4]

Besides molluscs, the Sukra authors have referred to several tiny insects belonging to the *Invertebrata*. Like the fish, the fly[5] is an object lesson for one of the six *vyasanas* or vices of Hindu Ethics. "The fly gets death by falling suddenly into the lamp, because of its mad passion through gratification of eyes by the light of the wick in a mild lamp." The danger of men from pleasures of *rupa* or sight is thus illustrated by the case of the fly. Similarly, the bee[6] illustrates the danger from *gandha* or smell. "The bee which has the power of cutting holes, and can fly with wings, gets, however, caught within a lotus because of its desire for smell." This lecture on the necessity for the control of the senses and the practice of self-restraint is repeated in the chapter on General Rules of morality: "The antelope, the elephant, the fly, the bee and the fish—these five are ruined through sound, touch, form, smell and taste respectively." So one should duly enjoy these things with restraint.

Another characteristic of bees has been recorded. At the very sight of poisoned food bees[7] begin to hum. This supplies a very good test for the detection of poisons, and is utilised by toxicologists.

Ants and worms have been referred to in Sukranîti—generically to indicate the meanest and minutest creatures of the animal world in the lines describing the ideal of *ahimsâ* or charity, mercy and philanthropy that people should hold before themselves: "One should serve as far as possible people who are out of employment, who are diseased, and who are aggrieved; should always look upon even ants and worms[8] as oneself; and even if the enemy be harmful, should be doing good to him."

SECTION 10.

Agricultural Live-stock in Sukranîti.

We have mentioned above that the *Ungulates* of the Vertebrate kingdom supply all the more important animals of domestic, social, and economic life. In

[1] Sukra IV, vii, 821-24.
[2] Sukra IV, i, 284.
[3] Sukra IV, ii, 117-118.
[4] Sukra IV, ii, 128.
[5] Sukra I, 207-8.
[6] Sukra I, 211-12.
[7] Sukra III, 33-34.
[8] Sukra I, 654-657.
[9] Sukra III, 20-22.

this section we propose to deal with the animals specially useful in agriculture. Such animals are (1) Bulls and bullocks, (2) Cows, (3) Buffaloes, both male and female, (4) Sheep, (5) Goats, (6) Horses and ponies, (7) Mules and donkeys, (8) Camels.[1] We have already disposed of sheep and goats in a previous section; and, as in Sukranîti, camels and horses are put specially to military purposes, we reserve their treatment for a subsequent section. Bulls also have been mentioned as draught cattle for the military establishment, but their importance in agriculture and ordinary conveyance is, however, well-known. We proceed, therefore, to cull from Sukranîti all references to cattle, ploughs, carts, &c., that have any bearing on agriculture.

Both agriculture and pasture are included in the list of topics dealt with in the science of *Vârtâ*, which coincides more or less with the modern science or art of Economics. "In *Vârtâ*[2] are treated interest, agriculture, commerce and preservation of cows." As Vârtâ is a branch of learning recognised in the curriculum of studies for princes, we may take it that matters connected with veterinary science, agricultural live-stock, entomology, &c, such as they were, had to be studied by persons who were called upon to rule over the destinies of mankind.

The cattle, however, affect the people more than princes. In *Sukranîti* we therefore have references to agriculture and the breeds of animals employed in it, specially in connexion with the activities of the people. Sukrachâryya has described the tending of cattle and cultivation of lands as two of the occupations of Vaiśyas,[3] and the driving of plough as one of the occupations of Sudras.[4] It is difficult to see the difference between cultivation of lands and drawing of ploughs, unless the former implies supervision or high class intellectual work in connexion with agriculture, and the latter purely mechanical, manual work. Whether Vaisya or Sudra, the cultivator certainly forms an important member of Sukrâchâryya's social system with his own customs, rites, traditions. It is, therefore, definitely laid down as a juristic principle that "The cultivators should have their disputes[5] decided according to the usages of their own guild, &c." And the drawing of ploughs is a kalâ.[6]

What would be called "Simple Co-operation" in modern phraseology is indicated in the following rule regarding agricultural life: "The women should be assistants[7] in the functions of males, *viz.*, agriculture, &c." We have here a maxim of the Cottage Industry System rendered natural through the organisation of the Joint-Family.

The only reference to the use of cattle in agriculture is in the lines, on the authority of Manu, describing the resort of Brahmanas to this occupation under certain conditions.[8] The conditions are that Brahmans must have 16 animals

[1] In the Punjab, Sind, and Western Rajputana camels are largely used for agricultural purposes instead of bullocks.

[2] Sukra I, 311-12.
[3] Sukra I, 83-84. See also IV, iii, 84.
[4] Sukra I, 85-6.
[5] Sukra IV, v, 85-86.
[6] Sukra IV, iii, 188.
[7] Sukra IV, iv, 54.
[8] Sukra IV, iii, 37-40.

to their ploughs. Kṣatriyas, when they take to agriculture, should have 12 cows. The normal number, *e.g.*, that for Vaisyas is 8. The Sudras may have 4 cows and the Antyajas 2 only. The difference in the number of cattle to be employed for the same work according to the caste of the worker, seems to have been justified in those days by the idea that, in the case of those whose normal occupations were non-agricultural, *e. g.*, Brahmanas and Kṣatriyas, agriculture should be looked upon when they do take to it, as an *āpaddharma*; and as they are not used to it, they should have as helpmates a larger number of cattle to relieve them of the physical strain than those whose ordinary occupation being manual does not require the extraneous help. The authority of Manu and other sages has been invoked to prove the legitimacy of agriculture being an occupation of Brahmanas.

The conditions of good cattle are indicated in the following line:

"The cow[1] with good horns and fine colour, which gives plenty of sweet milk, and has good calves has very high value, whether young, small or large."

The prices are given below:

(1) A good cow costs Rs. 8, *i.e.*, twice the price of a she-goat.[2]

(2) The high price for cows is, however, Rs. 64, or Rs. 80.

(3) The high price of a buffalo[3] is the same as that of the cow or one and a half times that, *i.e.*, Rs. 64 or 80, or 96 or 120.

(4) The high price for she-buffaloes[4] is Rs. 56 or Rs. 64, *i.e.*, lower than that for the male cattle.

The revenue[5] from agricultural cattle is realised at the following rates:

(1) One-eighth of the increase of cows and buffaloes.

(2) One-sixteenth of the milk of she-buffaloes.

The milk[6] should never be received by the king for his own kith and kin.

Carts have been referred to—not, however, in connection with agricultural purposes, but with the military establishment. But ordinary carts are implied in the following proverbs: "It is better to be poor first[7] and rich afterwards, just as it is better to be a pedestrian first and go in a vehicle afterwards." Also, "Pedestrianism is better than using bad vehicles."[8]

We have just noticed that only the cow has been specifically mentioned in Sukranīti as the agricultural live-stock. But much information on this head is not available from it. It requires to be noted, however, that the Sukra authors represent one of those stages in the history of Hindu national sentiment which gave concrete shape to the idea of the cow as a divinity. Thus as one

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[1] Sukra IV, ii, 186-187.
[2] Sukra IV, ii, 188-189.
[3] Sukra IV, ii, 193.
[4] Sukra IV, ii, 196.
[5] Sukra IV, ii, 239-240.
[6] Sukra IV, ii, 253-54.
[7] Sukra III, 569-70.
[8] Sukra III, 572-3. See also the references to carts drawn by horses as the conveyances of commanders and governors. V, 162-9.

of the most justifiable "grounds for war," according to the principles of International Law advocated by Sukrâchâryya, we read what may be compared with the cry of Sivâji, the great Hindu monarch of the 17th century: "There are no rules about the proper or opportune time and season for warfare in cases created by the killing of cows,[1] women, and Brahmanas." The physical considerations of time, place &c., must not weigh when the most vulnerable point of national honour and feeling has been touched by the adversary.

It may be possible to find out the age of *Śukranîti* from the history of this "Doctrine of the Divinity and Inviolability of the Cow" as a corner-stone of Hindu socio-religious system. The work must be attributed to a period not preceding the advent of the Musalmans, with their alien creed as a formidable rival to contest the sovereignty of the land with the people of Hindusthan.

It may be interesting to add here that in the western countries also thinkers have been gradually coming to appreciate the Cow-cult in their own way. Thus to quote from the *Encyclopædia Britannica* (Article on Dairy):

"If civilised people were ever to lapse into the worship of animals, the Cow would certainly be their chief goddess. What a fountain of blessings is the cow! She is the mother of beef, the source of butter, the original cause of cheese, to say nothing of shoe-horns, hair-combs and upper leather. A gentle, amiable, ever-yielding creature, who has no joy in her family affairs which she does not share with man. We rob her of her children that we may rob her of her milk, and we only care for her when the robbing may be perpetrated."

Section 11.

Economic Zoology in Sukraniti.

The various references in which the Fauna have been mentioned by Sukra authors must have given us an idea of the uses which their countrymen made of the animal world. The importance of animals in military life will be dealt with in the next section. In the meanwhile, we shall mention the odds and ends of the economic zoology of Sukrâchâryya that cannot be covered by all these.

Of course milk is one of the most important products of the animal world. Among the 64 kalâs we have two connected with this, *viz.*, milking[2] and churning. Similarly, ghee is also mentioned in Sukranîti as an article of great economic importance. One of the important items of State Interference in Indian Industry and Commerce seems to have been the prevention of Adulteration of Foodstuffs. We find even Sukrâchâryya combatting this evil.[3] The regulation is given in the following lines: "Falsehoods[4] must not be practised by any one with regard to ghee, honey, milk, fat, &c." Sukrâchâryya's state is a guardian

[1] Sukra IV, vii, 453. [2] Sukra IV, ii, 182.

[3] See the articles on *Adulteration* and *Dairy* in *Encyclopædia Britannica*.

[4] Sukra I, 590-2.

of the people's health and wealth, according to what Sidgwick would call the "Socialistic principle."

Not these innocent industries only—but even the more cruel and untouchable ones are noticed in Sukranîti. Thus, in addition to the above two kalâs, we have three more connected with animal life in the list of 64 arts:

(1) Softening of leathers.[1]

(2) Flaying of skins from the bodies of beasts.[2]

(3) Extraction of oil from flesh (fats).[3]

It is to be understood, as a matter of course, that the chemical and mechanical processes allied or auxiliary to the above industries must also have been well-known.

Commerce and Industry in leather must have been important enough. We do not find any reference to fishermen as a class or fishing as an occupation, as we have already noted. But we read of bird-catchers and leather merchants[4] among other classes of persons who deserve state encouragement.

And at least one product of the leather-industry was in universal demand, *e.g.*, shoes. Thus, among the general rules of morality to be observed by both people and princes, we have the following: "One should always bear medicinal substances in jewels, &c., consecrated by mantras, have umbrellas and shoes,[5] and walk in the streets with eyes fixed on the straight path only." Here we have the ideal of material life that a gentleman of the Sukra-days was expected to follow; and shoes form an item in what would have been regarded as the 'proper' or decent dress of a householder. That the use of shoes was common enough would be evident from the following happy adage of Sukrâcharyya also: "It is better to cover feet with shoes[6] than try to cover the whole earth with leather."

Flesh or meat as a diet is known to the Sukra authors, but, like fishing, eating it is a purely local custom confined to the artisans and artists of Madhyadesa.[7]

Worms and Insects[8] as destroyers of grains are known to Sukra authors. They have advised the king not to accumulate for future use those that have been thus attacked by pests. Information, however, is not copious.

Dr. Râjendralâl has pointed out in his Essay on Dress and Ornament in Ancient India that, among the presents brought by princes and potentates of various parts of India to king Yudhisthira, referred to in the Sabhâparva of the *Mahâbhârata*, various skins are mentioned. The skins of animals that lie in holes, and of wild cats, *i.e.*, the furs of varieties of martin and weasel families, were brought by the Kambojas of the Hindu Kush; Blankets by the Abhiras of Gujrat;

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[1] Sukra IV, iii, 180.
[2] Sukra IV, iii, 181.
[3] Sukra IV, iii, 187.
[4] Sukra II, 406-407.
[5] Sukra III, 8-9.
[6] Sukra III, 574.
[7] Sukra IV, v, 9-496.
[8] Sukra IV, iii, 56-57.

Clothes of the wool of sheep and goats or thread spun by worms (silks) by the Scythians, Tukhâras and Kankas; housings for elephants by princes of the Eastern tribes, lower Bengal, Midnapur, and Ganjam. Pâṇini also, has not only given words for wool, cotton, weaving, cloth, turbans, sewing, &c., but also for gives a special rule (IV, iii, 42). Woollen stuffs and furs as well as silks are silk for which he mentioned by Vâlmîki among the constituents of Sîtâ's trousseau (Râmâyana, I, 74). It may also be added that animal products, *e.g.*, the hair of Yak, Gour, Gayal and other bovine animals living in hills were used in the manufacture of one species of *châmaras*, or fly-flappers, described in the Yukti kalpataru as one of the most important insignia of royalty. Some idea of Economic Zoology may be formed from the fact that the author mentions the Meru, Himâlaya, Kailâsa, Malaya, Vindhya, Gandhamâdana and other mountains as the habitats of the animals yielding the requisite hairs of various kinds.

Dr. Râjendralâl has described some of the shoes and boots in Hindu India in his *Indo-Aryans*. We know the tender story of Bharata's placing a pair of Râma's slippers on the vacant throne of Ayodhya to officiate for him during his exile. Mediæval Sanskrit authors allude to them pretty frequently. The *Viṣṇu Purâṇa* enjoins all who wish to protect their person never to be without leather shoes. Manu forbids the use of others' shoes (IV, 66), as Sukra considers the use of others' gold and jewels, &c., as a *chhala* or social offence. The Purâṇas recommend the use of shoes in thorny places and on hot sand. Arrian notices the Indian shoes made of white leather, which, according to the description given, may be identified with the Uriya shoes of to-day. According to Mitra the material for these boots and shoes was bovine leather, and even the hide of sacrificed cattle. Âswalâyana quotes Sânvatya (IV, ix, 24) to mention the fact that the hide of cattle sacrificed in Sulgava ceremony is fit to be converted into shoes and other useful articles. So also hog-skin is a fit material for shoes according to a Vedic verse quoted by Savara Swâmî in his commentary on the Mimâmsa aphorisms. Râjendralâl also mentions leather bottles, leather jars (*driti*s in Manu), leather straps, strings and bands, leather sails, &c.

The following extract from Mr. Law's *Hindu Polity* based on the Arthasâstra of Kautilya would give an idea of the Economic Entomology or agricultural Zoology of the Hindus in the 4th cent. B. C. " It should be remarked that measures for the extermination of pests were also undertaken by Government. These pests generally included rats, locusts, injurious birds and insects and tigers. To destroy rats, cats and mungooses were let loose; some varieties of poison were also used for the purpose. To kill tigers, several kinds of posion were in use."

On the strength of evidences from Tamil sources bearing on South Indian life of the early Christian era, Aiyangar says[1]: " Among the woollens we find mention of manufactures from the wool of rats which was regarded as particularly warm. There are 30 varieties of silks mentioned, each with a

[1] *Ancient India p.* 65.

distinctive appellation of its own, as distinguished from the imported silks of China which had a separate name."

Marco Polo (1792 A.D.) describes Cambay as a port with "great trade in hides, which are very well-dressed."

According to the *Dharma Sutra* of Baudhâyana (i 2 4), traffic in wool and in animals with two rows of teeth (horses, mules, &c.) is a forbidden practice in the Dravidian districts,—the locale of this work according to Buhler,—but is common among the "Northerners" (*i.e.*, Western and North-western India, according to the geographical terminology of those days recorded by Hiuen Thsang also).

The following extract from the *History of Indian Shipping* pp. 77-78 relates to the traffic in animals in ancient times: "Lastly, there are several other *Jâtakas* in which we are told explicitly of a successful, if sporadic, deal in birds between Babylon and Benares, and of horses imported by hundreds from the North and from Sindh." The author quotes *Tandulanali Jâtaka*, *Suhanu Jâtaka*, *Kundaka-Kucchi-Sindhava-Jâtaka*, *Bhojajanuya-Jâtaka* and *Ajanna Jâtaka* and also Mrs. Rhys Davids' articles in *Economic Journal* and J. R. A. S. for 1901. In the days of Solomon also Indian peacocks, &c., found customers in Syria.

Prof. Mookerji quotes the *Baveru-Jâtaka* and the opinions of Buhler, Rhys Davids and Kennedy to show that peacocks were first taken to Babylon by Indian sea-going merchants in the 6th cent. B.C.

SECTION 12.

The Animal Corps in Sukranîti.

Horses, elephants, camels and bulls constitute the animal-corps of the Sukra state. The general rule about the relative proportion of these animals in the army is given in the following line: "The king should have in the army a predominance of footsoldiers, a medium quantity of horse, a small quantity of elephant force, equal number of bulls and camels, but never elephants in excess." This is stated more definitely as follows:[1]

Infantry	should be	4	times horse.
Bulls	,,	$\frac{1}{8}$	,,
Camels	,,	$\frac{1}{8}$	,,
Elephants	,,	$\frac{1}{32}$	,,

Thus the number of elephants is to be the smallest, the bulls and camels may be equal in amount or differ as $\frac{1}{8}$ or $\frac{1}{8}$ of horse.

The idea of Sukra statesmen is clearly known from the statement of the constituents of the Army in a state whose annual income is Rs. 1,00,000. The ruler of such a state[2] is advised to have

(1) 80 horses. (3) 2 elephants.
(2) 10 camels. (4) 16 bulls.

[1] Sukra IV, vii, 45-6. [2] Sukra IV, vii, 41.
[3] Sukra IV, vii, 47-52.

The budget of expenses on the military live-stock of this "unit" of political life is explicitly stated to be as follows:—

(1)	Horse (and Foot)	Rs.	48,000 per year.
(2)	Elephants, Camels, Bulls (and Fire-arms)...	„	4,800
	Total Rs. ...		52,800

The importance of the department of live-stock to the state would be evident from the fact that, together with (1) the Infantry and (2) the Fire-arms and other accessories, *e.g.*, chariots, carts, &c., the horses, elephants, camels and bulls constitute more than half of the permanent charges upon the finances of the kingdom. It is clear, therefore, that all Hindu financiers and statesmen, as well as rulers must have made themselves thoroughly well-grounded in the knowledge of habits, habitat, feelings, rations, stabling, embryology, anatomy, external characteristics, health, prices, classes, measurements, mettle, &c., of the live-stock. It is this which explains the abundance of Zoological lore among the Hindus, and the production by their scholars of works on economic zoology, veterinary science, physiology, &c., dealing with all the theoretical and practical or scientific and utilitarian aspects of Indian Fauna.

Besides the purely military uses of these animals, Sukranīti records some other uses also. The following reference to the animal-force indicates non-military as well as military uses: "The elephant,[1] the camel, the bull, the horse are excellent beasts of burden in the descending order. Carriages are the best of all conveyances except in the rainy season."

The use of horses for purposes of conveyance is further referred to in what looks like modern "horse-allowances" described in the following lines: "(1) The master of 10 villages, and the commander of 100 troops should travel on horseback with attendants; (2) The master of one village also should be a horseman; (3) The commander of 1,000 troops and the ruler of 100 villages should each have the conveyance of a chariot or cart and a horse, and 10 armed attendants should travel on horseback. (4) The ruler of 1,000 villages should always travel in vehicles carried by men or two horses. (5) The ruler of 10,000 villages can use all vehicles and four horses."

The use of elephants, also, as conveyance is granted to the "dignified parts" of the state: "The commander of 10,000 troops should travel on an elephant[2] with 20 attendants."

The references to carts or carriages drawn by horses should be noted.

Horse-Sacrifices have also been incidentally mentioned in *Sukranīti*. "Can virtue that is begotten of *aśwamedha*[4] come out of mere recital of hymns? So also, can the virtue arising from mercy come out of punishments?" The analogy is quite worthless, however. The horse to be used in the sacrifice would perhaps be called *Śyāmakarṇa*[5] according to the taxonomy in Sukranīti.

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[1] Sukra IV, vii, 352-53.
[2] Sukra V, 162-168.
[3] Sukra V, 167.
[4] Sukra IV, i, 108 9.
[5] Sukra IV, vii, 221-22.
[6] Sukra I, 622.

So also the religious ceremony in connexion with the *utsarga* or letting out or consecration of bulls is referred to. There is a law of the land regulating the people's action with regard to the custom: "Those who have let out bulls and other animals (after religious observances) must keep them within proper control"; *i.e.*, the animals must not be allowed to destroy public property or cause damages to the interests of the citizens.

The following is a general rule of morality to be observed by pedestrians while walking, and indicates the degree of danger that is to be feared from the animals: "One should keep 5 cubits from the carriage, 10 cubits from the horse,[1] 100 cubits from the snake, and 10 cubits from the bull."

Like the goats, the bulls are also known to Sukra authors to be stupid animals. Thus those kings are almost like oxen[2] (*i.e.*, fools) by whom their strength (army) is not increased, by whom princes are not made to pay tribute, and by whom subjects are not well-protected.

The elephant has left its deep mark on Hindu thought. Both Literature and Fine arts of the Hindus have preserved the most characteristic representations of this animal's internal and external features The rut gushing out of the elephant is a conventional symbol with Hindu poets for the excitement of passion in both physical and moral worlds. The havoc created by the animal in fury has also been the theme of many a noble specimen of Hindu sculpture and literature.

The moral lessons illustrated by the Sukra authors from the habits of this animal are given below: —

(1) There is a complete analogy between the processes of training elephants and the senses of man. "One should bring to bay or discipline, by the hook of knowledge, the elephant[3] of the senses which is running to and fro in a destructive manner in the vast forest of enjoyable things." This simile about wild and unbroken elephants is one of the most common devices in Sanskrit literature.

(2) The elephant is the object lesson, among other things, of the danger from the weakness of Touch-enjoyment: "The elephant[4] whose stature is like the peak of a mountain and who can uproot trees with ease, is, however, caught, because of the pleasure of contact with the female." This is expressed again, in the following: "The antelope, the elephant,[5] the fly, the bee, and the fish—these five are ruined through sound, touch, form, smell and taste."

Two professions have been incidentally noticed here, *e.g.*, those of catching and training the elephants.

The elephant is known to be proverbially huge and strong. "It is only the powerful elephant,[6] that can extricate an elephant from the mud. So also, it is a king who can deliver a king who has gone astray." Again, "The elephant[7] cannot be bound by thousands of bales of cotton."

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[1] Sukra III, 281-2.
[2] Sukra I, 249-50.
[3] Sukra I, 193-94.
[4] Sukra I, 205-6.
[5] Sukra III, 33-34.
[6] Sukra IV, vii, 834-35.
[7] Sukra IV, vii, 833.

But the elephant is no match for the lion : "Just as even the tiger and the elephant[1] cannot govern the lion—the king of beasts—so all the councillors combined are unable to control the king, who acts at his own sweet will."

We have already referred to the use of elephants as conveyance granted to the very high officials of the state. It is also advised that "the king should tour the city on the back of an elephant,[2] in order to please the people."

Section 13.

Horses.

(*a*) *External Anatomy.*

The anatomy and external characteristics of horses were very minutely studied. The fact that the Hindus laid down mathematically accurate rules for the artists to follow and demanded of them a strictly religious observance of those rules presupposes, and is an evidence in favour of, the view that they were past masters in anatomical surveys of the human and animal bodies. To those who would construct the images of horses, Sukrâchâryya's advice is: "If an image is to be made, the appropriate pattern or model should be always placed in front. No image can be made without a model. So the artist should frame the limbs after meditating on the horse[3] and finding out the measurements and attributes of horses in the manner indicated above." "In horses all limbs are made according to a certain proportion with the face."

The measurements of horses' limbs given by Sukrâchâryya will be explained in the section on the anatomy of the vertebrates.

(*b*) *Mettie and Worth.*

The appreciation of horses and their classification according to merit depend on the consideration of the following circumstances, both zoological and economic: (1) measurements of limbs, (2) certain general aspects and physiognomical features, and (3) marks on the animal's body, *e.g.*, feather-rings, &c., which are known to be auspicious or inauspicious, also (4) the place from which they come. But this last has not been described in Sukranîti.[4]

According to the measurements of limbs, we get the following tradition recorded by Sukra authors:

(1) The best horse[5] has a face of 24 angulas or inches.
(2) The good " " 36 " " "
(3) The medium " " 32 " " "
(4) The inferior " " 28 " " "

[*N. B.*—5 yavas=1 angula, according to Sukra.]

[1] Sukra IV, vii, 830-31.
[2] Sukra I, 744.
[3] Sukra IV, vii, 145-8.
[4] *Vide* Law's *Hindu Polity*, p. 36.
[5] Sukra IV, vii, 86-89.

The limbs which are to have a fixed proportion with the face should have the following measurements:

(1) Stature[1] is to be 3 times face.
(2) Length „ 4⅜ „
(3) Girth or Circumference of belly 3 times face + 3 angulas.

The measurements given by Sukrâchâryya differ from those given in Châṇakya's *Arthasâstra*,[2] as well as in *Aswavaidyaka*.[3]

The classification of horses, according to general physiognomical features, has been elaborately treated under 50 heads by Jayadatta in the third chapter of his *Aswavaidyaka*. In his notes on this chapter, Pandit Umeshchandra Gupta has quoted passages from Nakula's veterinary science, *Agnipurâṇa*, *Brihat Saṃhitâ*, *Hârâvali*, *Amarakośa*, and *Hemachandra*, but specially from *Sukranîti*. The extracts show similarity as well as divergence of ideas on the subject.

The general characteristics of horses regarding features, colour, gait, &c., appreciated by Sukra authors are indicated below :—

(1) That horse is beautiful[4] which has a high neck and a low back.

(2) The horse[5] with divine attributes, or excellent horse is that which has a beardless face, beautiful, smart and high nose, long and high neck, short belly, heels and ears, very swift speed, voice like the cloud and the gander or swan, is neither wicked nor very mild, has good form or colour and beautiful circular rings of feather.

(3) The following horses are disparaged:

(i) those with black legs, or with one white leg,[6]

(ii) those rough, grey-coloured or ash-coloured,[7]

(iii) those with black roof of mouth, black tongues, black lips; or throughout black but with a white tail,

(iv) those with one white mark on the forehead, but throughout coloured otherwise—(called *Dalabhanji*),[8]

(v) those that throw kicks, make sounds with lips, shake their backs, tend to go down into water, suddenly stop in the midst of a movement, lie down on the back, move backwards and leap up,[9]

(vi) those that have snake-like tongues, the colour of bears and are timid in character,[9]

(vii) those with marks on the forehead disfigured by a minute blot (of another colour),[9]

(viii) those which tear asunder the ropes[9] (cf. IV, vii, 217).

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[1] Sukra IV, vii, 91-95.
[2] See Law's *Hindu Polity*, p. 38.
[3] Chapter III, 181-188, published in the *Bibliotheca Indica* Series.
[4] Sukra IV, vii, 144.
[5] Sukra IV, vii, 226-28.
[6] Sukra IV, vii, 149-58.
[7] Sukra IV, vii, 234-35.
[8] Sukra IV, vii, 225.
[9] Sukra IV, vii, 328-31.

(4) Defects of colour (whether one or variegated) are not considered, if the form be beautiful.[1]

(5) So also the presence of bad hair-marks on the body is not minded if the animal is strong, has a good gait, is well-formed, and not wicked

(6) The following movements of horses are appreciated:[2]

(i) with legs thrown from a height,

(ii) gait like those of tigers, peacocks, ducks, parrots, pigeons or doves, deer, camels, monkeys and bulls. *Aswavaidyaka* also bears this out.

(7) One of the most practical tests of good horses is given by Sukra; thus, if the horseman does not get tired by riding a horse even after over-feeding and over-drinking, the gait of the horse is known to be excellent.[3]

The value of horses in terms of money, *i.e.*, their prices, according to Sukra authorities, are given below :—

(1) The high prices for horses and elephants is 2000, 3000 or 4000. Now a silver pala=8 *tolas* or rupees. Therefore, the price is 16,000, 24,000, 32,000 rupees. This seems to be extraordinary, especially from the following estimation of the best horse. Hence, the figures 2,000, 3,000, 4,000, are to be taken to indicate not *palas*, but silver *tolas* or rupees.

(2) The best horse is that which can go 100 *yojanas* (500 or 700 miles) a day. Its price is 500 gold (coins) *i. e.*, Rs. 8,000.

The price of horses according to Sukra Statistics would, therefore, normally range from Rs. 2,000 to Rs. 8,000.

(*c*) *Omens.*

The third consideration which weighs much in the valuation of breeds of horses is the presence or absence of ringlets, curly-feathers, hair-marks, pimples &c on the body of the animal. These have been described thoroughly with all their significance in LXVI and XCIII chapters of *Brihat Saṃhitâ*, as well as the chapter on marks in *Aswavaidyaka* previously referred to.

According to the Hindus the marks are good or bad omens,[5] and may be interpreted to indicate the character, qualifications, disposition, as well as future social or economic condition of men over whose bodies they appear.

The science of omens relates to the animals also, and what is more, foretells adversity or prosperity of their masters. It is natural, therefore, that the subject was minutely studied in those days. Thus Varâhamihira begins his discourse on omens [6] with a short historical treatment of the science:

" Risabha has written a treatise on omens embodying the views of the

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[1] Sukra IV, vii, 224, 236-37.
[2] Sukra IV, vii, 229-31.
[3] Sukra IV, vii, 238.
[4] Sukra IV, vii, 232-33.
[5] Varâhamihira has dealt with this topic in LV. of Brihat Saṃhitâ.
[6] Sukra IV, vi, Brihat Saṃhitâ, LXXXVI, 1-4.

gods Sukra, Indra, Brihaspati, Kapisthala, and Garuda, and of the Riṣis Bhâguri, Devala and others. Sri Devavardhana, the Maharaja of Avanti (Ujjayini) has written a treatise on omens, embodying the views of Bharadwâja. There are also treatises on omens by the seven Riṣis. Numerous treatises are also found on the subject written in ancient and modern languages. Then there are the treatises of Garga and others who have written works on Saṃhitâ. There are also treatises by writers who have written on Yâtrâ. Having examined all the above treatises, I proceed to write clearly this brief treatise on omens for the enlightenment of my pupils."

Our author has been referred to by Varâhamihira as an authority in the above bibliography. It appears Sukrâchâryya was a founder of this science. *Sukranîti* is perhaps the most elaborate of Niti-or Dharma-or Arthasâstras in the treatment of the subject, as would be evident from the references given below. It should be mentioned that the Sukra authors, Varâhamihira, Nakula and Jayadatta do not all agree in the valuation or enumeration of the marks or omens connected with the features of horses.

The *bhramaras* or *âvartas*, *i.e.*, marks on the horses' body consisting of feather-curls or hairy growths may be (1) circular—like ringlets, or (2) of any shape and size, as indicated by the following substances :[1] Conch, wheel, mace, lotus, altar, seat of meditation, palace, gate, bow, pitcher full of water, white mustard seeds, garland, fish, dagger and Srivatsa gem.

These 16 are known to be auspicious signs. As for the circular ones, their significance, good or evil, is to be known from the following general rules :

(1) These may be (i) leftwards or rightwards, (ii) full or partial, (iii) small or large.[2]

(2) In the female horse, the leftward or anti-clockwise ring is auspicious ; in the male the rightward or clockwise.[3]

(3) The results vary also with the directions in which they are formed, *e.g.*, downwards, upwards or oblique ;[4] thus on the leg the downward mark is good, on the forehead the upward.[5]

These general remarks on hairy growths, whether circular or shaped like the objects enumerated above, have been the basis of a classification of horses according to merit. This is dwelt on more elaborately as below :

(1) *Excellent* horses[6] are those that have these marks on (i) nose-tip, (ii) forehead, (iii) throat, (iv) head.

(2) *Good* or *Middling*[7] horses are those that have such marks on (i) breast, (ii) neck, (iii) shoulder, (iv) waist, (v) navel, (vi) belly, (vii) front of the

[1] Sukra IV, vi, 159-11.
[2] Sukra IV, ii, 154-55.
[3] Sukra IV, vii, 156-57.
[4] Sukra IV, vii, 158.
[5] Sukra IV, vii, 212.
[6] Sukra IV, vii, 162-168.
[7] Sukra IV, vii, 164-5, 208-05. There is a repetition of waist and sides in the two references.

sides, (viii) back, (ix) lower lip, (x) space between ear and eye, (xi) thighs, (xii) forelegs.

(3) *Bad* horses[1] are those that have marks on (i) eyes, (ii) jaws, (iii) cheeks, (iv) breast, (v) upper lip, (vi) kidney, (vii) knee, (viii) genital organ, (ix) hump of the back, (x) right waist, (xi) right foot.

A few more good and bad marks are enumerated below :—

(*a*) *Good*:

(i) If two marks are noticed on the cheeks of a horse, they lead to the increase of the master's fame and territory.[2]

(ii) Two marks on the forehead with space between indicate good, and are like the sun and the moon. If they overlap, they give medium results.[3]

(iii) Three marks on the forehead with space between them, one being on the top, are indicative of good.[4]

(iv) One mark in the middle of the throat[5] is very auspicious and prevents all harms.

(v) On the leg the downward mark is good, on the forehead the upward.[6]

(*b*) *Bad*:

(i) The horse that has a mark on the left cheek is wicked and leads to loss of wealth.[7]

(ii) If the horse has marks in the mouth (or face?) or at the end of the belly, it is sure to get death or cause ruin of the master.[8]

(iii) The marks on knees give troubles of life abroad.[9]

(iv) The mark on the genital organ causes loss of[9] victory and beauty.

(v) The mark at the end of the vertebral column means total ruin.[9]

(vi) If on the forehead two marks be too contiguous, they are inauspicious.[10]

(vii) Three triangular marks on the forehead are causes of grief.[11]

(viii) The mark on the back of the genital organ or on the nipple or near the ear[12] is bad.

(ix) The horse that has an upward mark[13] on the leg is disparaged as the uprooter of posts.

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[1] Sukra IV, vii, 200-2. It has to be noted that there is a contradiction in this enumeration with that in 162-65 as regards navel, waist and throat.

[2] Sukra IV, vii, 174-75.

[3] Sukra IV, vii, 206-7.

[4] Sukra IV, vii, 208-9.

[5] Sukra IV, vii, 211.

[6] Sukra IV, vii, 212.

[7] Sukra IV, vii, 186.

[8] Sukra IV, vii, 191-2.

[9] Sukra IV, vii, 193-5.

[10] Sukra IV, vii, 207,209.

[11] Sukra IV, vii, 210.

[12] Sukra IV, vii, 214-15.

[13] Sukra IV, vii, 217.

(*d*) *Breeds.*

The artificial taxonomy of horses according to the adventitious marks on their bodies has created along with it a system of nomenclature also, which, according to Hindu tradition, again, is a good index to the quality, mettle and other characteristics of horses. In Sukraniti we have the technical names of the following classes or breeds :

(1) *Purṇaharṣa*[1]—with two marks on the brow and a third on the head.

(2) *Suryya*[2]—with a mark on the backbone—leads to the increase of master's horses.

(3) *Trikuta*[3]—with three marks on the forehead—leads to the increase of horses.

(4) *Vâjisa*[4]—with three marks on the neck—is the lord of horses in the royal stable.

(5) *Sarvanâma*[5]—with only one mark on the cheek—leads to the owner's ruin.

(6) *Siva*[6]—with a mark on the right cheek—leads to the happiness of the master.

(7) *Indra*[7]—with two spots on the ears—gives victory in wars and leads to happiness.

(8) *Vijaya*[8]—with marks on the nipples—gives victory in wars and leads to happiness.

(9) *Padma*[9]—with two marks on the side of the neck—brings several *padmas* (Padma = one thousand billions) of wealth as well as unceasing happiness to the master.

(10) *Bhupâla*[10] or *Chakravarti*—with one or three marks on the nose.

(11) *Chintâmani*[11]—with one large mark on the throat—leads to the realisation of the desired objects.

(12) *Sulka*[12]—with marks on the forehead and the throat—gives increase and fame.

(13) *Dhumaketu*[13]—with a mark at the origin of the tail—is ruinous.

(14) *Kritânta*[14]—with a mark on the rectum, the tail and the end of the vertebral column.

(15) *Ekaraśmi*[15]—with a mark on one of the upper sides of the neck.

(16) *Panchakalyâna*[16]—with five white marks on the face and four legs.

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[1] Sukra IV, vii, 166-7.
[2] Sukra IV, vii, 168-9.
[3] Sukra IV, vii, 170-1.
[4] Sukra IV, vii, 172-3.
[5] Sukra IV, vii, 176-7.
[6] Sukra IV, vii, 178-79.
[7] Sukra IV, vii, 181.
[8] Sukra IV, vii, 182.
[9] Sukra IV, vii, 184-5.
[10] Sukra IV, vii, 186-7.
[11] Sukra IV, vii, 188-9.
[12] Sukra IV, vii, 190.
[13] Sukra IV, vii, 196-7.
[14] Sukra IV, vii, 198-99.
[15] Sukra IV, vii, 216.
[16] Sukra IV, vii, 219.

(17) *Aṣṭamangala*[1]—with the five white marks of Panchakalyâna, and three more white, *e.g.*, on the breast, neck and tail.

(18) *Śyâmakarṇa*[2]—with one colour throughout the body, but with ears coloured *śyâma* (*i.e.* greenish, swarthy, &c). If that one colour be white, the horse is sacred and deserves to be worshipped.

(19) *Jayamangala*[3]—with eyes like *vaiduryya* gem.

(20) *Dalahbanji*[4]—with one very white mark on the forehead, but coloured otherwise throughout—brings contempt upon the owner.

A classification of animals which has been adopted in the case of elephants has not been recorded by Sukra authors with reference to the horses. This has, however, been noticed in the Arthasâstra.[5] Thus, horses were regarded as belonging to the three classes or types of *tikṣṇa* (fiery), *bhadra* (gentle) and *manda* (sluggish).

It is also strange that Sukra authors should have omitted altogether a very important mode of economic classification of horses, *e. g.*, that according to their places of origin. The *Aswavaidyaka* has devoted a whole chapter[6] to this topic, called the chapter on *janmadesa* or Habitat or Zoological Distribution, as we would call it in modern times, and deals with the subject under nine heads: *e.g.* (1) good horses, (2) second-class horses, (3) worst-class horses, (4) *Tâjika* horses, (5) *Pârasîka* horses, (6) *Kekkana* horses, (7) *Turaska* horses, (8) *Bhândaja* horses, (9) *Saindhava* horses, &c.

The Arthasâstra,[7] also, mentions the following classes of horses, according to their natural habitats: (1) Kâmboja (Afghanistan) (2) Sindhu (Sindh) (3) Âratta (Punjab, according to Cunningham, p. 215), (4) Vanâyn (Arabia), (5) Bâlhîka (Balkh), (6) Sauvira (Eder in Guzrat, according to Cunningham, or Sophir of the Bible), (7) Pâpeye, (8) Taitala.

Of these places the first four were held to supply the best breed, and the remaining four the horses of the second quality. Horses of inferior quality came from other sources.

It may be mentioned here that almost all the places enumerated by Kautilya have been noted by Vâlmîki in the *Bâlakânda* of the Râmâyaṇâm (Canto VI, 22).

Trade in horses[8] seems also to have been a feature of South Indian commercial life in the 1st cent. A.D. Thus in the *Periplus* we have the description of Puhar, a port on the East coast, where "horses were brought from distant lands on the seas."

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[1] Sukra IV, vii, 220.
[2] Sukra IV, vii, 221-2.
[3] Sukra IV, vii, 223.
[4] Sukra IV, vii, 234-35.
[5] Law's *Hindu Polity* p. 86.
[6] *Vide* the 6th chapter of the work in the *Bibliotheca Indica* Series. This throws much light on the Economic or Commercial Geography of ancient India.
[7] Law's *Hindu Polity*, pp. 86-87.
[8] Aiyangar's *History of India*, p. 66.

(e) Training and Management.

Lt. General Sir Fitzwygram deals with the construction and ventilation of stables, stable fittings, watering and feeding, forage, grooming, shoeing, exercise, and stable management in part I of his work, "Horses and Stables." All these topics are the subject-matter of Jayadatta's *Aswavaidyaka* in several chapters, and have been described more or less in all Hindu treatises, called Arthsâstras or Nitisâstras, which have been handed down from at least the 4th century B.C.

It is, however, only during the last hundred years that, owing to the "enormous losses[1] produced by the ignorance of the true origin of disease, veterinary art has been recognised as second only in its usefulness to the care of human life." * * * "In the increasing value of domesticated animals useful to man, and in the greater ravages of disease, as must be the case where animals, more or less intended to roam at large, are crowded together ; as must be the case where land increases in value, and where also population increases in numbers and daily requires larger supplies of food ; in the increasing value and need of domestic animals, and in their increasing ailments arising from domestication, modern veterinary science has had its rise."

The humanity of the Hindus, as displayed in their care for animals since at least the 6th century B. C.—the epoch of the founders of Buddhism and Jainism—as well as the progress of their knowledge about animal-life, medical treatment of the dumb creatures, and the social, economic and political importance of Fauna, constitutes one more of the solid evidences regarding the great advance of the people of Hindusthan in spirituality and material civilisation, long before the "strong Son of God, immortal Love" flourished under the "Syrian blue." The unfounded remarks of Western scholars explaining away, without rhyme or reason, the antiquity of the original achievements of the Hindus in secular and physical sciences or arts, require, in the light of more rational and unbiassed investigations which they pretend to monopolise, only to be mentioned to prove their absurdity. It is strange that sentiments—for they are no better than sentiments—engendered by race-pride and colour-prejudice, like the following, expressed in the most categorical fashion and sweepingly general terms, should find a place in a scientific work like the *History of Mathematics*[2] published in the first decade of the 20th century :—

"The Hindus, like the Chinese, have *pretended*[3] that they are the most ancient people on the face of the earth, and that to them all sciences owe their creation. But it would appear from all recent investigations that these *pretensions*[3] have no foundation ; and in fact *no*[3] *science or useful art* (except a rather fantastic architecture and sculpture) can be traced back to the inhabitants of the Indian peninsula prior to the Aryan invasion. This invasion

[1] Fitzwygram's *Horses and Stables* (Longmans, Green & Co., London, 1911), Fifth Edition, pp. 512-513.

[2] By Ball (Macmillan & Co., London, 1908), Fourth Edition, p. 146.

[3] The *Italics* are ours.

seems to have taken place in the latter half of the 5th century[1] or in the sixth century."

To return to the topics of horse training and management in *Sukranîti*. Sukrâchâryya says, as we have noted in a previous context: "The elephant, the horse,[2] the bull, the child, the wife, and the parrot get the qualities of their teachers through association." The staff connected with the management of horses consists of three classes[3] of men : (1) *aswâdhipati* or superintendent of cavalry, (2) *siksaka* or trainer, (3) the *sevaka* or groom. These, together with other items in the administration of the cavalry, will be treated of in the section on organisation of the Veterinary Department.

Some general observations[4] regarding forage, exercise, &c for horses are given below :—

(1) Defects grow in horses through long-continued absence of work. But through excessive work the horse grows lean and emaciated.

(2) Without bearing burden, the horse becomes unfit for any work

(3) Without food, the horse becomes sickly, but with excessive feeding, it contracts disease.

(4) It is the good or bad qualifications of the trainer that give the horse good or bad gait.

We may compare these practical rules about grooming and training with those of a modern specialist[5] which apply especially to race-horses in India :

"(1) It is most important that the trainer should recognise the fact that he can greatly increase a horse's speed by practice.

"But experience teaches us that we must be very careful in applying the fact, that speed can be greatly increased by practice, to horses ; because, if we push it to an undue extent, they will be apt to become disgusted with their work, and may refuse to "try."

"(2) I am much averse from the plan of throwing sound, healthy horses altogether out of training during the summer, for hard condition once lost takes a long time to regain. A sound horse should get all through the hot weather a fair amount of healthy work.

"(3) The trainer, while supplying the horse with food suitable for the requirements of his system, when undergoing severe work, should never lose sight of the fact that the proper assimilation of such food can only be ensured as long as the functions of digestion are in a healthy state.

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[1] What is the meaning of this date? This bit of recent investigation deserves a place by the notorious feat of Dugald Stewart in proving the Sanskrit language to be an invention of the crafty Brahmans!

[2] Sukra III, 582-3.

[3] Sukra II, 260-63, 270-78, 274-75.

[4] Sukra IV, vii, 239-43.

[5] Haye's *Training and Horse Management in India* (Longmans, 1905), pp. 150, 151, 164, 170, 172.

"(4) Horses should be made to walk smartly. Nothing looks slacker or causes an animal to walk in a more slovenly manner than the way syces often lead horses, with a long rein or rope over their shoulder, while they hobble along in front at the rate of about two miles an hour."

(f) Grooming.

The theory of grooming has been explained by General Fitzwygram[1] in his answer to the question—"why does the stabled horse require constant grooming, whilst the same horse turned out into a field does well enough without it?" "It is the work and the food, not the shelter," says he, "which constitutes the difference between the domesticated animal and the horse in a state of nature. * * * As long as the horse remains in a state of nature, taking only the exercise required for gathering his food, and feeding only on laxative diet, grooming is not needed, because the debris of the food and the excretions of the system are carried off mainly by the action of the bowels and the kidneys. The cart horse, whose work is slow, can get on with very little grooming. The hunter and the race horse, on the other hand, whose whole systems are developed to the utmost, require much more grooming than is necessary for carriage and ordinary riding horses. * * * Cavalry horses in camps require grooming just as much, and in some respects more than they do in barracks. * * * Grooming, or in other words, cleanliness of the skin, is not, as many suppose, a mere matter of appearance, or of a rough or smooth coat; but it is essential to the general health and condition of the domesticated animal."

It is remarkable that the Sukra authors, who have been writing mainly of the cavalry horses, should have been well-acquainted with the physiological aspects of grooming, as would be evident from the particular care they have insisted on the syces and servants in attending to the rations, health and comfort of the animals under their charge. The following rules of Sukrâchâryya about shampooing, washing, cleaning, &c., as well as feeding and exercise connected with the art of grooming, testify to their thorough grasp of the subject and may be compared with the most recent ideas about it.

(1) The horse that has got fatigue through work should be given a slight stroll for sometime, then should be fed upon sugar and powdered grains mixed with water.[2]

(2) The horse should be given *gur* (molasses) and salt just after work, before the saddle and fittings are brought down. Then when the sweat has disappeared, and it has stood calm and quiet the horse should be relieved of its fittings and reins.[3]

(3) The horse should be made to stroll in the dust after its limbs have been rubbed, and carefully tended with baths, drinks and foods[4].

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[1] Horses and Stables, pp. 66-7.
[2] Sukra IV, vii, 270-71.
[3] Sukra IV, vii, 275-78.
[4] Sukra IV, vii, 29-80.

(4) If the horse be made to carry burden, just after taking food and drink, it soon gets coughs, breathlessness and other diseases.[1]

General Fitzwygram[2] appreciates the Indian method of grooming in the following words:

"In India the native groom often cleans his horse by hand-rubbing or shampooing. The practice is good and has an excellent effect on the skin. It would be difficult, probably impossible, to get English grooms to adopt a practice so novel. But * * * the author believes the practice would be found most beneficial. The action of the hand never irritates the skin, which the brush frequently does."

(*g*) *Forage.*

We have just noted that according to modern Physiology and Hygiene feeding and grooming cannot be dissociated from each other and do in fact form two inter-connected functions of one and the same work, *viz.*, tending of domesticated horses. The treatment of food must inevitably come hand in hand with the other aspect of the general art of tending. It is perfectly natural, therefore, that rations of horses, and their cleaning, rubbing, washing, &c., have been dealt with by Sukra equestrians as an organically blended topic. Thus in the above remarks about grooming we have noticed also the treatment of the forage.

Besides sugar, salt, *gur* (molasses), and powdered grains or peas, called *saktu*, the varieties of horses' food are indicated in the following lines:

(1) The horse should be given peas or grains, mâsa, mungo (*phaseolus mungo*), both dry and wet, as well as well-cooked meat.[3]

(2) Wines and juices of forest or wild animals take away all the defects of horses.[4]

(3) The horse should be made to take milk, ghee, water and powdered grains.[5]

Sukrâchâryya thus recommends mineral, vegetable as well as animal food. The following order[6] indicates the varying degrees of nutritive rations known to our author:

(1) Best food—*e.g.*, Barley and pea.

(2) Second class—*e.g.*, Mâsa and makustha.

(3) Inferior stuff—*e.g.*, Masur and mungo.

The *Arthasâstra*[7] of Kautilya has given more elaborate rules about rations to be observed by the superintendent of horses. In the dietary for the best horse we find curd, milk, meat, among other articles.

The importance of sugar in the rations of horses is thus indicated by Hayes:[8] Cane sugar is the best of all restoratives for animals in a state of

[1] Sukra IV, vii, 283-4.
[2] *Horses and Stables*, p. 70.
[3] Sukra IV, vii, 272-73.
[4] Sukra IV, vii, 281.
[5] Sukra IV, vii, 282.
[6] Sukra IV, vii. 280.
[7] See Law's *Hind. Pol.* pp. 40-42.
[8] *Training and Horse Management in India*, p. 25.

exhaustion, because it can be absorbed into the system with little or no preliminary preparation by the digestive juices. Also the more tired a horse is, the more torpid are his disgestive organs. Therefore a solution of sugar is a far better restorative to a fatigued horse, supposing that the amount of sugar is equal to that of the starch in the gruel."

This explains the two rules of Sukrâchâryya about the kind of food to be administered to horses just after work. To appreciate the physiological significance of the rations prescribed in *Sukraniti*, Hayes' chapters on varieties of food, sketch of the theory of food and nutrition, watering horses, and practical rules for feeding and watering horses, should be read along with this section.

(*h*) *Rules about exercise.*

"As air is to the lungs or food to the stomach, so is exercise to the due development of the muscles, tendons, ligaments, and respiratory organs. In the horse, on account of the active exertions which we require from him, we wish to get the muscles as firm, the tendons and ligaments as strong, and the respiratory organs as vigorous as possible. * * * In the ox and sheep, and other animals which are used for food, we wish to have the flesh less firm and more tender ; and therefore we give him little or no exercise."

The above extract from Fitzwygram's work on Horses and Stables furnishes the theoretical considerations guiding the exercises of horses. It is evident that exercises would vary with the climate and seasons of lands. The rules of Sukra authors about the exercise of horses[1] according to seasons are given below :

(1) One should ride the horse in the morning and evening in *hemanta* (October and November), winter and spring, in the evening in summer, and in the morning in autumn.

(2) One should not use the horse in the rainy season nor on uneven grounds.

We have in the section on horticulture noticed the rules for watering plants adapted to the seasons, and had reasons for guessing that the rules indicated the conditions of life obtaining in Eastern India. In the present instance, also, the specially noticeable feature is the importance given to the rainy season, and this, again, probably points to the abundant rainfall in Eastern India.

The beneficial effects of exercise are thus described by Sukrâchâryya : "The appetite, strength, prowess, and health of the horse are promoted by well-regulated movements."[2]

The following are the rules for 'breaking' the horse :

(1) A circular breaking or training ground[3] has to be prepared. The circumference may be (i) 1,000 *châpas* or *dhanuṣ* (=4,000 cubits), (ii) 500 châpas or 2,000 cubits, (iii) 1,000 cubits, (iv) 400 cubits, or (v) 200 cubits.

[1] Sukra. IV, vii, 266-68. In *Aswavaidyaka* a whole chapter has been devoted to the treatment of seasons.

[2] Sukra IV, vii, 268. [3] Sukra IV, vii, 261-63.

(2) The movement or speed of the horse should be daily increased by exercises [1] within the circular ring in such a way that it can run 100 yojanas (400 or about 700 miles) in a day. This speed has been taken to be the criterion of the best horse in the calculation of prices [1] also. As for the daily increase of speed we have already noticed the theories of Sukra and Hayes.

(3) The ideal speed of horses is, again, indicated in the following rule, which, however, does not tally with the above :

"The good horse [2] should go 100 *dhanus* or 400 cubits in 16 mâtrâs." Horses are inferior according as the speed is lower." [As 10 mâtrâs=4 seconds, the rate given here would be about 64 miles an hour.]

(*i*) *The Art of Training.*

Feeding and grooming, the two parts of the work of tending horses, form the duty of the syce or groom. Exercise and Breaking also form part of his duty. But these aspects of horse-management may be conveniently left to the trainer or *sikṣaka* ; for he is responsible for the character, gait, paces, speed, &c., of the animal, which depend, to a considerable extent, on exercise, breaking, &c.

We have already noticed that "it is the good or bad qualifications of the trainer that give the horse good or bad gait ; " and we have just seen that the ideal speed which the horse should be expected to approximate is 64 miles an hour or 700—800 miles a day. The trainer must therefore be well up in the rules of horsemanship, which are given below :

(1) The good trainer is he who moves his legs below the knees, keeps his body erect, is fixed in his seat, and holds the bridle uniformly.[3]

(2) The good trainer should strike the horse at the proper place by whips mildly, and not too severely but with medium pressure.[4]

It is the proper use of the whip, in which, according to Sukrâchrâyya, consists the secrect of good horsemanship or success in jockey's art :—

(1) In the first place, one should never ride a horse without a whip,[5] and should overpower the animal by whips when necessary.

(2) In the second place, he must not use it indiscriminately or very often, or strike the horse at wrong places ; for then he adds to the defects of the animal, which last for ever.[6]

(3) The following are the rules for striking a horse :—(i) at the sides,[7] if it neighs, or if it slips, (ii) at the ear, if it shies, (iii) at the neck, if it goes astray, (iv) at the space between the arms, if angry, (v) at the belly, if absent-minded.

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[1] Sukra IV, vii, 264-65. [A yojana=4, 5, 7, or 8 miles.]
[2] Sukra IV, ii, 199.
[3] Sukra IV, vii, 248.
[4] Sukra IV, vii, 244-45.
[5] Sukra IV, vii, 246-7.
[6] Sukra IV, vii, 258.
[7] Sukra IV, vii, 255-57.
[8] Sukra IV, vii, 248-50.

Or [1] (vi) at the breast, if it be terrified, (vii) at the neck, if it neighs, (viii) at the posterior, if it slips, (ix) at the mouth, if going astray, (x) at the tail, if angry, and (xi) at the knees, if absent-minded.

The function of the trainer[2] would thus appear to consist of the following classes of work :

(1) To promote the good disposition of the horse and maintain its proper mettle by skilful management, as just described.

(2) To qualify horses as swift racers by proper exercise, &c., as described in the previous sub-section.

(3) To train their gait, *i.e.*, teach them elegant paces according to the rules of military life, sportsmanship, hunting or ordinary riding.

Some of these paces were enumerated in the section on the general physiognomical and other features of horses ; *e.g.*, like those of tigers,[3] peacocks, ducks, &c. A few remarks about the gait and movements of horses have also been made there.

According to *Arthasâstra*[4] "horses were trained not only for the ordinary work of the state, but also for the more difficult movements required in war." The paces and trots enumerated by Sukrâchâryya differ, however, from those given by Kautilya, both as to name and description.

According to Sukra authors, movements are of 11 kinds :[5]

(1) *Chakrita*—circular.
(2) *Rechita*—galloping.
(3) *Valgita*—prancing.
(4) *Dhaurita*—trotting.
(5) *Âpluta*—jumping.
(6) *Tura*—speedy.
(7) *Manda*—slow or sluggish.
(8) *Kutila*—tortuous.
(9) *Sarpaṇa*—serpentine.
(10) *Parivartana*—rolling, revolving.
(11) *Âskandita*—galloping at full speed.

Of these, the following six[6] have been characterised by Sukrâchâryya thus—

(1) *Dhârâ*—which seems to be equivalent to *tura* in the above list—is known to be that pace which is very fast, in the midst of which a horse would get puzzled if spurred with the heels.

(2) *Âskandita*—that in which the horse contracts its forelegs and runs with rapid leaps.

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[1] Sukra IV, vii, 252-54.
[2] See also Sukra II, 270-73.
[3] Sukra IV, vii, 229-31.
[4] Law's *Hindu Polity*, pp. 42-44. See the technical terms used by Kautilya
[5] Sukra II, 270-73.
[6] Sukra IV, vii, 287-98.

(3) *Rechita*—that with short leaps, but continuous.

(4) *Pluta*—that in which the horse leaps with all the four legs like the deer.

(5) *Dhauritaka*—rapid movement with uncontracted legs very useful in drawing carriages or chariots.

(6) *Valgita*—that in which the animal runs with contracted legs, neck raised like that of the peacock, and half the body trembling.

(*j*) *Stables and Trappings.*

Sukraniti is silent about stables. We read only that horses are well-kept in watered lands,[1] and that stables for horses should be built in the northern side[2] of the palace. Kautilya deals with the subject very elaborately and treats of the ventilation, sanitation,[3] accommodation of the houses to be built for the horses.

As for the trappings, we have noticed them in connexion with grooming. One of the 64 Kalās is the preparation of saddles[4] for horses, elephants, bulls and camels.

The instrument by which the horse is to be controlled is the bridle or reins, which has been elaborately described.[5]

For cleansing purposes an instrument with seven sharp teeth[6] is used.

Section 14.

Elephants.

In modern India elephants are used principally and solely as draught-animals. The following extract from Lieut-Colonel G. H. Evans' *Elephants and their Diseases*[7] would give an idea of the uses to which they are put:

"Elephants may conveniently be divided into two classes, namely,—(*a*) timber-elephants, (*b*) baggage or travelling elephants.

Timber-elephants, again, may be divided into two classes, namely, (i) trained tuskers, (ii) trained males and females.

Well-trained tuskers have at all times commanded a good price; they are much more useful, both in yards and forests, as with their tusks they can 'oung', *i.e*, butt and stack timber, carry butts and planks, assist in getting logs over obstacles or in clearing blocks in creeks. * * * Though tuskers are largely employed in dragging operations, still most of such work is generally performed by tuskless males and females. Most Burmese elephants are trained to timber-work, and to some extent to carrying baggage."

In ancient and mediæval India, however, the elephant force constituted a special and characteristic feature of the Animal-corps Alexander had to encounter on the Hydaspis a Hindu army which was remarkably strong in its elephant-force. Megasthenes' description of the capture of elephants is one of

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[1] Sukra IV, vii, 349-50.
[2] Sukra I, 451-3.
[3] Law's *Hind. Pol.*, pp. 38-39.
[4] Sukra IV, iii, 194.
[5] Sukra IV, vii, 341-44.
[6] Sukra IV, vii, 346.
[7] Pp. 7-8 (published by Superintendent, Government Printing, Burma, 1910).

the earliest pieces of literature on the subject.[1] "One of the four well-known divisions[2] of the old Hindu army was the elephant-force * * * There has been on record many a battle in early Indian history in which elephants carried the day."

It is not strange, therefore, that the animal should have drawn towards it the attention of Hindu poets, scholars, Ayurvedists, artists, politicians, &c., from the earliest times. We have already noticed the vast literature on the life, habits, medical treatment, &c., of elephants It may also be noted that the elephant is very abundant in, and almost a characteristic fauna of, India. The abundance of the animal and its nearly uniform "distribution" throughout the land, account for the considerable uses made of it by kings in every part of the country and the impression made upon the thought of the people everywhere. Besides their distribution in present times along the foot of the Himâlayas as far west as Dehra Dun, forests between Gangâ and Kriṣṇâ, Western Ghats, Mysore, and Ceylon, "there is evidence[3] that about three centuries ago elephants wandered in the forests of Malwa and Nimar, while they survived to a later date in the Chanda district of the Central Provinces. At the comparatively remote epoch, when the Deccan was a forest tract, they were probably also met with there."

The rearing up of a good breed of elephants was recognised as one of the special cares of Chandragupta's Government. "The killing of an elephant was visited even with capital punishment."[4] Kautilya has treated the subject elaborately in *Arthasâstra.*

But Sukrâchâryya has paid more attention to horses than to elephants or the other animals in the army.

(*a*) *Mettle and worth.*

According to Hindu writers, the appreciation of elephants like that of horses depends on the following considerations :—(1) measurements of limbs, (2) certain external characteristics and internal temperament, (3) marks or omens, (4) places of origin. Sukrâchâryya has not touched the last two, and has dealt with the first two items very summarily.

The general physiognomical and other features of elephants that are much appreciated can be known from the following remarks :

(1) The best of all elephants[5] is one which has long cheeks, long eyebrows and long forehead, has the swiftest speed, and has auspicious marks on the body.

(2) Harmful elephants are those that have blue palates, blue tongues, curved tusks or no tusks, who persist long in their angry moods, whose rut gushes out without any systematic order, who shake their backs, who have less than 18 nails, and whose tails touch and sweep the ground.[6]

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[1] Book III, Fragment XXXVI.

[2] Law's *Hind. Pol.*, p. 47.

[3] *Encyclopædia Britannica*, 11th Edition, Vol. 9, p. 260.

[4] Law's *Hind. Pol.* [5] Sukra IV, vii, 83-84. [6] Sukra IV, vii, 64-67.

A modern writer[1] on the subject enumerates the following points of a good elephant which may be compared with those given by the ancient Hindu author: medium height, a good big barrel, skin soft and wrinkled (described by Burmans as crocodile skin), the head massive, full cheeks, and a broad forehead; the ears large, eyes bright and kindly and free from opacity or excessive flow of tears; the trunk of good length, broad at the root, and blotched in front with pinkish coloured spots. The neck short, thick and full; chest broad, the back straight and broad, broad loins; short forelegs, convex in front (*i.e.*, set up like a lion). The hind quarters full, sloping well down and supported by thick short limbs. The pads of the feet hard, nails smooth and polished, action free, paces fast and easy; the tail should be of good length, free from hardness, and provided with a good tuft of bristles."

The tests of Varâhamihira of the 6th century A. D. are given in the following lines taken from the 67th chapter of *Brihat Saṃhitâ*,[2] called 'characteristics or features of elephants':

(1) "The elephant whose lips and mouth are red, whose eyes resemble those of the sparrow, whose tusks are shining, grow upwards and have sharp ends, whose face is large and long, whose backbones are like bows, long and invisible, whose *mastakas* (round protuberances on the temples) are covered with hair and resemble the turtle, whose ears, mouth corners, navel, forehead, and genital organs are large, whose body resembles the turtle, whose nails are 18 or 20, whose trunk has three lines and is round, whose tail is beautiful, and whose juice (when in rut) is felt to be of good smell when the animal blows through its trunk, will bring on wealth.

(2) The elephant whose tail is long, trunk red, roar like that of clouds, and neck large, long and round, will bring wealth to a king.

(3) Non-rutting elephants, those which possess extra or defective organs, those which are lame or short, or whose tusks resemble the horns of the sheep, whose testicles are visible, those which possess little or no trunk, whose mouth corners are brown, blue, black, or of different colours, those which possess very little hair about the face, those which have no tusks, those which have no virility, female elephants possessing the features of a male elephant produce misery."

These and sundry topics of economic importance in connection with elephants have been dealt at length in the 36th chapter of Book IV of Sivadatta's *Pâlakâpya*.

Hindu tradition, as we have just seen, attaches much importance to the number of nails. The following remarks of Evans throw much light on this question: "Some animals have four nails on each foot; this decreases their value, as five nails on each foot raises the same; four on each of the front feet and five on the hind ones does not interfere with their value. Out of a total of

[1] Evans: *Elephants and their Diseases*, pp. 8-10.

[2] Iyer's *Brihat Saṃhitâ*, Part II pp. 98-99.

62; Indian, Burmese, and Siamese elephants, only three possessed twenty nails[1] $\frac{5-5}{5-5}$, 500 had eighteen $\frac{5-5}{4-4}$, 104 sixteen $\frac{4-4}{4-4}$, and 16 seventeen toes $\frac{5-4}{4-4}$."

It would appear, therefore, that the very fact of 18 and 20 nails being rare has had something to do with the worth of animals among the Hindus. We incidentally notice here the minute observation of limbs and other features of animals that was a characteristic of Hindu intellect.

(b) Omens.

The auspicious marks have been referred to in *Sukranîti*, but have not been described. The *Brihat Samhitâ* has enumerated some of the omens connected with elephants which may be interpreted to indicate prosperity or adversity of the owners. A few remarks apply equally to horses and elephants. Certain special points applying only to the latter, *e.g.*, those connected with the cutting, breaking, etc., of the tusks are being given below:[2]

"(1) If the cut be white, smooth, glossy and emitting good scent, there will be prosperity. All that I now proceed to state about the breaking of tusks applies also to the dropping down, becoming thin and loss of colour.

(2) "If the elephant be found to walk unsteadily, if its ears cease to move, on a sudden, if the animal be of dejected appearances or if it be found to put its trunk to the ground or to breathe softly and long, if the eyes be full of tears, if the animal be found to sleep always or to be restive or to refuse to eat properly, or to pass excrement or urine often, there will be misery."

Burmese tradition on the subject has been recorded by Evans in *Elephants and their Diseases*.[3] "The following peculiarities in some animals reduce their value, as they are regarded with superstitious dread by the Burmese. It is thought that the ownership of such creatures may cost their masters loss of life or substance:

(1) A loose fold of skin, descending from the throat down to the forelegs."
(2) Moving head up and down and simultaneously from left to right.
(3) Swinging the trunk only to the left and right.
(4) Restlessness of the whole body somewhat after the fashion of bears.
(5) Holding the trunk up in the air and putting it into the mouth."

(c) Breeds.

The *Hastisâstras* have handed down various systems of taxonomy, both economic and more or less zoological. In *Sukranîti* we have only one system of terminology and classification. "There are four classes[4] of elephants in order of merit:

(1) *Bhadra*—(*a*) "that which has tusks coloured like honey (*i.e.*, not

[1] *Elephants and their Diseases*, p. 12.
[2] Iyer's *Brihat Samhitâ* Part II. pp. 212-13.
[3] Pp. 11-12.
[4] Sukra IV, vii, 68.

pure white, but yellowish, which is strong and well-formed, is round and fat in body, has good face and excellent limbs;"[1] (*b*) "the height[2] or stature is seven cubits, length eight cubits, and girth or circumference of the belly ten cubits."

(2) *Mandra*—(*a*) "that which has a fat belly,[3] lion-like eyes, thick skin, thick throat and thick trunk, medium limbs, and a long body;" (*b*) height[4] six cubits, length eight and girth nine.

(3) *Mriga*—(*a*) "that which has small or short throat,[5] tusks, ears and trunk, big eyes, and very short lips and genital organ, and is dwarf;" (*b*) height five cubits,[6] length seven cubits and girth eight cubits.

(4) *Misra*—(*a*) "that which has these[7] characteristics in mixture,"—*i.e.*, a non-descript, incapable of being specified as belonging to a particular type, (*b*) no measurements given.[8]

It would appear that the 'artificial' classification given here is meant only to indicate by technical terms the permutation and combination of external characteristics previously mentioned.

Varâhamihira also recognises these four classes of elephants in Chapter LXVII, but describes them in a slightly different[9] manner. The second class is called by him *manda* and not *mandra*, and the last *sankirṇa* and not *miśra*. The measurements given by him agree with those in *Sukranîti* except in the following rule recorded by the latter:—"But it is mentioned[10] by sages that the lengths of the mandra and bhadra class would be equal." The additional information in *Brihat Saṃhitâ* is about colour of the animals:—

(1) The *Bhadra* is of green colour and is a rutting animal.
(2) The *Mandra* is of yellow colour.
(3) The *Mriga* is of black colour and is also a rutting animal.
(4) The *Sankirṇa* is of mixed colour and a rutting animal.

About the height of elephants[11] Evans makes the following remarks:—

"Extravagant estimates of the height of elephants have from time to time been recorded; their great bulk so far exceeds that of the ordinary animals we are accustomed to see that the tendency is to overestimate their size. The old method of measuring was also most misleading: a rope was simply thrown over the back, the ends brought to the ground on each side, and half the length taken as the height. Much amusing information on this subject is contained in Sanderson's excellent work. Madras elephants, he tells us, were at one time

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[1] Sukra IV, vii, 69-70.

[2] Sukra IV, vii, 79-80. [*N.B.*—In elephant measurements, 8 yavas=1 angula. 24 angulas=1 kara or cubit. In horse-measure, 5 yavas=1 angula. Sukra IV, vii, 77-8, 85.]

[3] Sukra IV, vii, 71-72.
[4] Sukra IV, vii, 81-82.
[5] Sukra IV, vii, 73-74.
[6] Sukra IV, vii, 81-82
[7] Sukra IV, vii, 75.
[8] Sukra IV, vii, 76.

[9] See the original Sanskrit Text in the *Bibliotheca Indica Series*, edited by Kern (Calcutta, 1865), pp. 388-40

[10] Sukra IV, vii, 82

[11] *Elephants and their Diseases*, pp. 4-5

said to be from 17 to 20 ft. high, and an animal of Dacca was said to be 14 ft. Mr. Corse, a gentleman thoroughly conversant with elephants * * * was rather surprised to find that according to his measurement the animal said to measure 14 ft. did not exceed 10 ft. in height (a very good height). We may take it on the authority of Sanderson * * * that such a thing as an elephant measuring 10 ft. at the shoulder does not exist in India, nor may I add, in Burma. The largest male he ever met with measured 9 ft. 10 in. and the tallest female 8 ft. 5 in * * * Of 300 elephants measured in this Province the average height was 7 ft. 10½ in. * * All these animals were measured at the shoulder as is done with horses."

It is evident from the above that the Indian method of measuring heights is different from that of measuring animals at the shoulder. Therefore, the extraordinary height attributed to Indian elephants by people as well as scholars of Hindusthan, is quite natural and perfectly explicable, and in fact does very well tally with the statistics recorded in modern times. According to the Hindu authorities the *bhadra* or the best class attains a height of 7 cubits or 10½ ft., and the *mriga* or ordinary class has a stature of 5 cubits or 7½ ft., and this, measured not by the new method, but the old Indian method. If the heights of the old method be reduced to the new standard, the Bhadra would be very much under 10½ ft. *i.e.*, about 8 or 9 ft.; and the Mriga would be about 5 or 6 ft. We should therefore be inclined rather to think that the Hindu writers have understated the highest stature attainable by elephants; for, as we have just seen, the Dacca elephant measured 10 ft., and the average elephants measure generally 7 ft. 10½ in.; *i.e.*, the ordinary animals are equal to the highest classes mentioned in the standard Sanskrit works on elephants.

Abul Fazl records the Hindu tradition of the four classes of elephants in the *Ayeen Akbari*,[1]—that Imperial Gazetteer of India in Moghul times:

"The natives of Hindusthan hold this animal in such estimation that they consider one of them as equivalent to 500 horses. * * * The price of an elephant is one hundred to a lac of rupees. Those of five thousand, and of ten thousand rupees price, are not uncommon. * * *

There are four kinds of elephants. *Behder* (Bhadra) is that which has well-proportioned limbs, an erect head, broad breast, large eyes, and a long tail, with two excrescences in the forehead resembling large pearls. These excrescences are called in the Hindovee language Guj Manik, and many properties are ascribed to them. Another kind called *Mund* (Mandra) has a black skin, and yellow eyes; is bold and ungovernable. That called *Murg* (Mriga) has a whiter skin, with moles, and its eyes are of a mixture of red, yellow, black and white. That called *Mirh* (Misra) has a small head, and is easily brought under command: Its colour is a mixture of white and black, resembling smoke. And from mixtures of the above kinds are formed others of different names and properties."

[1] Part I pp. 146-147 (Translation published in 1788).

It should be remarked that Kautilya's *Arthasāstra* does not enumerate these four classes ; his silence may probably be taken to mean the absence of the idea in the 4th century B. C. But the *Yukti-kalpataru*, also, a work later than *Brihat Saṃhitā*, which treats of elephants, horses, cattle, &c., and mentions the eight classes of elephants called *Diggaja*, *e.g.*, *Airâvata*,[1] *Pundarika*, &c., with their characteristics as well as the four classes, *e.g.*, Brahmana, Kṣatriya, &c., does not record the four-fold distinction noted in Sukranîti and Brihat Saṃhitâ. So the mere silence of Kautilya is no evidence against the absence of the tradition in his times.

The number four seems to have been a favourite with Hindu authors in thinking of classes. For corresponding to the four castes in social life we have four classes of elephants and also four classes of wood. Thus "according to the *Brikṣa Ayurveda*[2] or the Science of Plant-Life (Botany) four different kinds of wood are to be distinguished : the first or the *Brahmana* comprises wood that is light and soft and can be easily joined to any other kind of wood ; the second or the *Kṣatriya* class of wood is light and hard, but cannot be joined on to other classes ; the wood that is soft and heavy belongs to the third or *Vaisya* class ; while the fourth or the *Sudra* class of wood is characterised by both hardness and heaviness."

The classification of breeds according to the places of origin has not been mentioned in *Sukranîti*, but recorded by Kautilya : "The sources of supply of elephants[3] were the following places : (1) Kalinga, (2) Anga, (3) Karusa (eastern portion of the district of Shahabad in Behar) supplying elephants of the best quality ;

(4) Prâchya (east), (5) Dasarṇa (modern Mandasore), (6) Aparanta (western countries, *viz.*, Konkan and Malabar), supplying elephants of medium quality ;

(7) Surâstra (Guzrat) and (8) Panchajana (in Northern India), supplying elephants of inferior quality."

The following extract from the *Ayeen Akbari* would also furnish information regarding some aspects of the Economic or Commercial Geography of Mediæval India : "Elephants are taken in the following places In Agra, in the wilds of Begavan, and Nerwar, as far as Berar. In the Subah of Allahabad ; near Ruttenpoor ; Sirgetchch ; the Subah of Malwa ; Hattendeyah ; Achowd : Chundary ; Suntwass ; Bijegurh ; Roysan ; Hosengabad ; Gurh ; Haryegurh ; in the Subah of Behar on the Borders of Rohtas ; at Jharkhend ; and in the Subahs of Bengal and Orissa, particularly at Satgong, there are great numbers. The best elephants are those of Tipperah."

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[1] Two of these eight names have been referred to in Sukra II. 256-58

[2] *History of Indian Shipping* (Longmans, Green & Co.), 1912 by Prof. Radhakumud Mookerji, p. 20.

[3] Law's *Hindu Pol.* pp. 50-51.

The money-value of elephants, according to the statistics supplied by the Sukra authors, is indicated below :

(1) Good elephant[1] (or horse) costs 2,000, 3,000, or 4,000 rupees.

(2) The elephant[2] that is unrivalled in strength, height, fight and *mada* (rut) is priced at 2000 *niṣkas* [Niṣka is the value of gold weighing 4 *mâṣâs*; and in estimating the value of elephants, 5 *ratis* = 1 *mâṣâ*] or Rs. 6,666.

We have already noticed the remarks of Abul Fazl about the high prices of these animals. Evans' remarks on Prices are given below : "Prices vary according to age, good points, temper, training, and length, thickness, and sweep of the ivory. * * * A full-grown well-trained tusker will command as much as Rs. 7,000 and a well-trained female as much as Rs. 5,000 Elephants that are trained to baggage work or slightly to timber may cost Rs. 4,000." These are known to be high prices.

(*d*) *Training and Management.*

Information in Sukranîti regarding the rations, grooming, exercise, training, medical treatment, stabling, &c., of elephants is very scanty, almost nothing. Some of these items have been but casually noticed, as we have seen previously. Thus we read : (1) One should bring friends and foes to submission by appropriate methods as snakes, elephants and lions are tamed.[3] (2) The elephant, the horse, the bull, the child, the wife and the parrot get the qualities of their teachers through association.[4]

The art of training has been mentioned among the subjects that should be studied by the man who is to be in charge of elephants.[5] We have also read previously of professions connected with the capture of the animals. There are two *kalâs*[6]—one relates to the driving or guiding, and the other to the teaching or training.

The *Arthasâstra*[7] gives more details. About capture of the animals we are told that the captors, taking with them five or seven female elephants roamed about in the summer—the season for the capture of elephants—in the forest, and traced the whereabouts of herds of elephants by folllowing the course of their dung and urine, and by observing their footmarks, the spots where they reposed, the banks of rivers, lakes, &c., they damaged.

Kautilya divides elephants into four classes according to their training:

(1) *Damya*—those that are being trained.

(2) *Upavâhya*—those trained for riding, &c., in times of peace.

(3) *Sânnahya*—trained for war.

(4) *Vyâla*—refractory and difficult to be broken, because of obstinacy, perversity, bad temper, &c.

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[1] Sukra IV, ii, 198.
[2] Sukra IV, ii, 203-6.
[3] Sukra IV, i, 48-49.
[4] Sukra III, 582-3.
[5] Sukra II, 256-9.
[6] Sukra IV, iii, 166.
[7] Law's *Hind. Pol.* p. 51-7.

There were several clearly marked out stages in the process of taming. For war purposes the elephants were taught seven kinds of movements ; for riding they were taught eight movements. The movements for military purposes are :—

(1) *Upasthâna*—rising, bending, jumping over fences &c.
(2) *Samvartana*—turning.
(3) *Samyâna*—moving forward straight or transverse or making serpentine movement.
(4) *Vadhavadha*—killing and trampling down.
(5) *Nâgarayana*—assailing forts and cities.
(6) *Hastiyuddha*—fighting with other elephants.
(7) *Sângrâmika*—other cognate movements relating to war.

The elephant is governed by the hook[1] which has two teeth, one for movement forward, and the other for movement backward.

About stables Sukrâchâryya says nothing. We are only told that elephants are well-kept in forests.[2] The sixth chapter of the 4th Book of *Pâlakâpya* describes in prose the nature of the soil, the direction, the size, shape, doors, &c of the stables suitable for elephants : and the 5th chapter of the second Book advises great precaution in allowing visitors into the *hastisâlâs* for fear they might cause damages to the animals by administering poisons, &c. The effects of poisons on various substances, animals, milk, fire, &c., are treated here quite elaborately. In connexion with the housing arrangements should be noted also the religious ceremonies for the propitiation of the gods described in the last two chapters of the Book IV.

Kautilya's treatment of stables[3] in the Arthasâstra is full enough. "There were two sets of stables, one in the fort, and the other outside ; in the former were kept those animals that had already been trained for war and riding, and in the latter those that were being trained, together with the refractory animals.

An elephant stable was twice as high as the length of an elephant, and its width was half its height ; it was made to face either the north or east, had separate apartments for female elephants, had a spacious corridor, &c."

SECTION 15.

Bulls and Camels in Sukranîti.

The celebrated Sanskrit manuscript, called *Yukti-kalpataru*, has several sections devoted to animal-life. Three of these relate to Bulls and Cows, their character, merits and defects. There are two methods of classification adopted in this treatise with regard to Bulls : (1) into Brahmanas, Kṣatriyas, Vaisyas and Sudras, and (2) into Sâtwika, Râjasika and Tâmasîka.

Information supplied by Sukra authors is very meagre. We read—

(1) Bulls get the qualities of their trainer through association.[4]

[1] Sukra IV, vii, 339-40.
[2] Sukra IV, vii, 349-50.
[3] Law's *Hindu Pol.* p. 51.
[4] Sukra III, 582-3.

(2) The price of a bull[1] with good horns, fair colour, sufficient strength, which can carry burdens and can walk fast, and which has the height of eight tâlas is Rs. 480.

(3) The bull is controlled by the string which passes through the nose.[2]

(4) Bulls are well-kept in watered lands.[3]

Regarding camels we are told—

(1)—The high price of camels is known to be that of the buffalo,[4] *i.e.*, Rs. 56 or Rs. 64.

(2) The good camel[5] is one which can go 30 yojanas (120 or 210, or 240 miles in one day. Its price is 100 silver palas or Rs. 800

(3) The camel, like the bull, is governed by the strings.[6]

(4) Camels, like elephants, are well-kept in forests.[7]

The following are the remarks of Abul Fazl about camels :

"From the encouragement given by His Majesty, there are now bred in Hindusthan camels that excel those of Turan and Iran.

"A number of these animals are selected, and always kept ready to fight for diversion. The head *Khaseh* camel, named *Shah Pussend* (the king's choice), and who is a native of Hindusthan, has for the space of 12 years conquered all antagonists.

"Camels are bred in the following places : Ajmere, Judhpoor, Nagore, Beyganur, Jalmeer, Hetinda and Tahresir ; and in the Subah of Gujrat, near the province of Kutch are great numbers and very fine. But in Sind are the greatest abundance. The swiftest camels are those of Ajmere, the best for burden are bred in Tatah" * * * Camels do not live above 24 years."

The *Ayeen Akbari* gives details about the daily rations of camels according to age, their furniture, methods of training and anointing them, the administrative staff in connexion with this branch of Imperial live-stock, and prices, etc.

The Hindus had been for ages skilled in the training and management of camels. And it appears that the camel-post was one of the Moghul institutions for the conveyance and transmission of news : "Reybary is the name given to a tribe of Hindus, who are skilled in the management of camels. They teach the Hindu Look (species of camel) to travel at a great rate. Although for the speedy conveyance of intelligences postmen are stationed at every five *cose* (10 miles) from one extremity of the empire to the other, yet a great number of these camel riders are continually in waiting at the palace to carry order."

About Bulls the *Ayeen Akbari* gives the following information : "Throughout Hindusthan the ox is esteemed lucky and held in great veneration. Every part of the empire produces good oxen, but those of Gujrat are

[1] Sukra IV, ii, 194-195.
[2] Sukra IV, vii, 345.
[3] Sukra IV, vii, 349-50.
[4] Sukra IV, ii, 198.
[5] Sukra IV, ii, 201-2.
[6] Sukra IV, vii, 345.
[7] Sukra IV, vii, 349-50.

esteemed the best. These will travel 36 miles in the course of 24 hours, and they are swifter than the generality of horses. Sometimes a pair of them are sold for 100 mohurs, but they are very commonly of 10 and 20 mohurs. There are also abundance of fine oxen in Bengal and the Deccan, that will kneel down to be loaded. Many cows at Delhi give daily 20 quarts of milk each, and are sold for more than 10 rupees. His Majesty has a pair of bullocks which cost 500 rupees. In the neighbourhood of Tibet and Kashmeer, are the Katars, which are of a very extraordinary appearance. This animal lives seldom above 25 years.

Section 16.

The Anatomy of the Vertebrates.

(*a*) Hindu Literature on Human Anatomy.

Like mineralogy, Botany, and Zoology, the Anatomy of the Hindus lies scattered through all branches of Hindu literature, Vedic, Paurâṇic, Tântric, Medicinal, Astronomical, and Sociological.

The Hindus have described five hundred muscles,—four hundred in the extremities, sixty-six in the trunk, and thirty-four in the region above the clavicle. They knew of the ligaments, sutures, various vessels and nerves, lymphatics and nerve plexuses, seven layers of skin, Mânasadharâ or Fascia, Medhadharâ or Adipose tissue, Raktadharâ or Vascular tissue of blood vessels, Pittadharâ or Mucous membrane of the digestive canal, Sleṣmadharâ or Synovial membranes, etc. There are allusions to Vapâ (pericardium), Hridaya (heart), Fusfusa (lungs) Yakrit (liver). Pliha (spleen), Vrikka (kidneys), Mastiskam (brain), Adhipati (medulla),[1] etc.

Any tubular structure is called by them a *nâdi* or vessel. But they distinguish three sorts of *nâdis*: (1) Dhamani (artery) carrying wind, (2) Sirâ (vein) carrying blood, (3) Srota (canal), including the large and small intestines, ducts of the various glands, lacteal vessels, etc.

1. *The Nervous System of the Tantras.*

The contributions of the Hindus to anatomy are recorded in many non-medical works,—*e.g.*, the Tantras—the last phase of Yoga philosophy in India—the records of Hindu culture in mediæval times. It is only very recently that the Tantras have begun to be edited and translated.[2] But in 1885 one of these documents of Hindu allegorical literature and mystical lore, *viz.*, the *Shiva Saṃhitâ*, was translated into English by Rai Bahadur Srischandra Basu.

In his Prize Essay on the Hindu System of Medicine published in the *Guy's Hospital Gazette* of London (1889). Major B. D. Basu, I.M.S., referred to the anatomy of the Tantras in the following words: "When these Tantras

[1] The Ayurvedic System of Medicine by Dr. Sumant B. Mehta of Baroda (Navsari, Bombay, 1913), and Dr. Gananath Sen's Medical Science in Ancient India (Sâhitya Sabhâ, Calcutta, 1908).

[2] See the *Tantrik Texts Series*, edited by Avalon, and *Mahânirvâṇa Tantra* translated previously by Manmathanath Datta, recently revised by Avalon (Luzac & Co., London, 1913.)

will be studied by oriental scholars, as closely as they have explored other branches of Sanskrit learning, the anatomical knowledge of the ancient Hindus shall be better known to the world;" for, according to him, "better anatomy is given in the Tantras than in the medical works of the Hindus."

From *Shiva Saṃhitâ* now republished in the "Sacred Books of the Hindus Series," we learn that the Hindus were acquainted with the spinal-cord and the brain. They knew that the central nervous system is composed of grey and white matters. They discovered the central canal of the spinal cord, and traced its connexion, through the fourth and third ventricles, with the lateral ventricles of the brain. They call it *Brahmarandhra*, or the dwelling-house of the human soul. The same Tantric work gives a description of the several ganglia and plexuses of the nervous system. The brain is said to be composed of *Chandrakalâ*, or convolutions resembling half-moons.

The nervous system of man is in fact more accurately described in the mystical Tantras than in purely medical treatises. In a paper on the Anatomy of the Tantras, originally published in the "Theosophist" of March 1888, and reprinted in the Introduction to Shiva Saṃhitâ in the Sacred Books of the Hindus Series, Major Basu has tried to unravel the mystery of the Yogis and Tântrists regarding the nerves and nerve-centres, and identify the *Nâdis*, *Chakras*, and *Padmas*. The following is a reproduction from that paper.

The language of the Tantras being too allegorical and too mystical to be understood by the uninitiated, it is very difficult to identify the Nâdis, the Chakras, and the Padmas described in them.

However, some of the spots are easily identifiable from their simple and lucid description. Thus it is apparent that the "nectar-rayed moon" (*vide* Shiva Saṃhitâ, Ch. II, verse 6) is the underpart of the brain; that "Suṣumna" is the spinal cord; "Idâ" and "Pingalâ" are the left and right sympathetic cords respectively.[1]

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[1] The Uttar Gitâ has thus described the relations of these structures (Ch. II, verses 14 and 15):—

"The bony column that extends (*from* the coccyx) to the occiput is called the Brahmadanda (*i.e.*, the vertebral column). Within this is the thin cord Saṣumnâ, which is also called Brahmanâdî by the wise. This Suṣumnâ is midway between the Idâ and Pingalâ."

Another Tantric work named, Sat-Chakra Nirûpaṇam, has thus described the position of these three Nâdis:—

"Outside the spinal canal, on the left is the Idâ and on the right is the Pingalâ, while within the canal and midway between the above two Nâdis is the Suṣumnâ, whose structure is like a rope."

Prof. Cowell identifies Suṣumnâ with the coronal artery (vide his translation of Maitreyi-opinishad, p. 270, footnote. Published by the Asiatic Society of Bengal.) While Pandit Rama Prasad Kasyapa, M. A., identifies Suṣumna with trachea, and Idâ and Pingalâ with left and right bronchi (Occult Science, the Science of Breath. Published at Lahore, 1884).

But it is clear from the above description that these three famous Nâdis are the spinal cord and the two sympathetic cords.

We shall try now to identify some of the nervous structures described in the Tantras :—

"Chitra."—From the description of this Nâdî in the Tantras (Shiva Samhitâ, Ch. II, verses 18-19), it may be identified with the grey matter of the spinal cord. For "in it is the subtlest" of all hollows called "Brahmarandhra," which is nothing else save the central canal of the spinal cord—a structure whose functions remain as yet to be discovered by the physiologists. The Tantrists appear to have traced its connection with the lateral ventricles of the brain. It has been considered by them to be the seat of the human soul. Even in these days, when it is no exaggeration to say that the Hindus have quite forgotten the scientific truths discovered by their ancestors, they point to the hollow space in the crown of the head (known as the anterior fontanalle) of the new-born child as the Brahmarandhra.

Every tyro in anatomy knows that this space contains the lateral ventricles of the brain.[1]

The "Sacred Triveṇî" (Shiva Samhitâ, Ch. V, p. 52) is the spot in the medulla oblongata where the sympathetic cords join together or whence they take their origin. (*Vide* Ashby's Notes on Physiology,—Article Medulla Oblongata). The mystic Mount Kailâsa (Shiva Samhitâ, Ch. V, p. 154) is certainly the brain.

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[1] Prof. Sir Monier Williams has defined Brahmarandhra to be "a suture or aperture in the crown of the head and through which the soul is said to escape on death." (Sanskrit-English Dictionary.) Now the learned professor's definition explains nothing. Had he consulted the Tantras and known the space called the Brahmarandhra by the modern Hindus, we doubt not his conclusion would have been the same as ours (*i.e.*, he would have identified the Brahmarandhra with the central canal).

2. A Hindu renegade thus delivered his verdict on the anatomy of the Tantras, &c. :

"It would indeed excite the surprise of our readers to hear that the Hindus, who would not even touch a dead body, much less dissect it, should possess any anatomical knowledge at all..... It is the Tantras that furnish us with some extraordinary pieces of information, concerning the human body..... But of all the Hindu Sâstras extant, the Tantras lie in the greatest obscurity.....The Tantric theory on which the well-known Yoga called "Shat-chakra-bheda" is founded, supposes the existence of six main internal organs, called Chakras or Padmas, all bearing a special resemblance to that famous flower, the lotus. These are placed one above the other, and connected by three imaginary chains, the emblems of the Ganges, the Yamuna and the Saraswati.....

"Such is the obstinacy with which the Hindus adhere to these erroneous notions, that even when we show them by actual dissection the non-existence of the imaginary Chakras in the human body, they will rather have recourse to excuses revolting to common sense, than acknowledge the evidence of their own eyes. They say with a shamelessness unparalleled, that these Padmas exist as long as a man lives, but disappear the moment he dies."—Physical Errors of Hinduism, Calcutta Review, Vol. XI, pp. 436-440.

A Daniel has come to Judgment. Did the Hindu renegade take the trouble to compare the Chakras with the Plexuses of modern Anatomy? Had he done so, he would not have talked such nonsense. His paper contains two diagrams, one of the six Chakras and the other of the different viscera as represented by the modern Tântrists.

Padmas and Chakras.—Great difficulty arises in identifying these Padmas and Chakras. What are these structures one is tempted to ask? Are they real, or do they only exist in the imagination of the Tântrists? Though we are unable to satisfactorily identify them, we nevertheless believe that the Tântrists obtained their knowledge about them by dissection. These terms have been indefinitely used to designate two different nervous structures, *viz.*:—nervous plexuses and ganglia. But it may be questioned, how are we authorized to identify the Tantric Padmas and Chakras with either the ganglia or plexuses of the modern anatomists? Our reasons for doing so are the following:

1st.—The position of some of these Padmas and Chakras corresponds with that of the plexus or ganglion of the modern anatomists.

2nd.—These Chakras are said to be composed of petals designated by certain letters, which clearly point to either the nerves that go to form a ganglion or plexus, or the nerves distributed from such ganglion or plexus.

3rd.—Certain forces are said to be concentrated in these Chakras, thus identifying them with the plexuses or ganglia which the modern physiologists have proved to be "separate and independent nervous centres."[1]

This Nâdî Suṣumnâ has six Padmas (Shiva Saṃhitâ, Ch. II, v, 27, p. 12), evidently signifying the six nervous plexuses formed by the spinal cord.

The description of the thousand-petalled lotus (Shiva Saṃhitâ, p. 51) shows it to be the medulla oblongata.

We proceed next to the identification of the famous six Chakras of the Tantras:—

i. *Mulâdhâra Chakra* (Shiva Saṃhitâ, p. 44) is the sacral plexus.

ii. *Swadhisthâna Chakra* (Shiva Saṃhitâ, p. 46). There can hardly be two opinions as to its being the prostatic plexus of the modern anatomists.

iii. *Manipur Chakra* (Shiva Saṃhitâ, p. 47) appears to be the epigastric plexus.

iv. *Anahat Chakra* (Shiva Saṃhitâ, p. 47) is the cardiac plexus.

v. *Viṣudha Chakra* (Shiv Saṃhitâ, p. 48) is either the laryngeal or pharyngeal plexus.

vi. *Ajnâ Chakra* (Shiva Saṃhitâ, p. 47) is the cavernous plexus.

We have very briefly hastened over the six Tantric Chakras. We see that these Chakras are the vital and important sympathetic plexuses, and preside over all the functions of organic life.

There can be little doubt that by the "contemplation" on these Chakras, one obtains psychic powers.

"Contemplation" leads to control over the functions of these Chakras or plexuses. "The intimate connection between the sympathetic nerves and the

[1] Gray's Anatomy, 10th Edition.

great viscera renders it highly probable that the sympathetic system has mainly to do with the organic functions. * * * The sympathetic is the system of organic life." When one gets control over the sympathetic nervous system, one is the master of one's body, one can die at will. The heart beats at his will. The lungs, the intestines, nay, all the different viscera of the body, carry on their allotted duties at the command of such a Yogi. Verily, verily, that is the stage of Samâdhi.

The learned translator has treated only of the five externalities of Yoga in his elaborate introduction. He has not dwelt on the Dhyâna, Dhâraṇâ and Samâdhi. As "Pratyahâra is not a distinct method in itself, but is a result of Prâṇâyâma," so Samâdhi is the stage brought about by the processes of Dhyâna and Dhâraṇâ. As "by Pratyahâra, the subjective world overcomes the objective," so by Samâdhi, the spiritual nature of man stands predominant over the gross physical one. Pratyahâra must be clearly distinguished from Samâdhi. No more serious mistakes, we think, can be committed than considering the hybernation of the reptiles and other animals as illustrating the Samâdhi stage of the Yogis. The hybernation corresponds with the Pratyahâra, and not the Samâdhi stage of Yoga. The learned translator has happily compared the Pratyahâra stage with the stage of insensibility produced by the administration of anæstheties, *e.g.*, chloroform (Introduction to the Shiva Saṃhitâ, Ch. X, pp. lvii, *et seq*). But it is a well-known fact that the inhalation of chloroform has little perceptible effect upon the sympathetic nerves. The spiritual conciousness of man is intensified only when the functions of the organic life are brought under his control, and when he can modify and regulate the functions of the different viscera. We repeat that that is the stage of Samâdhi.

It behoves all students of Yoga and occultism then to gain a clear knowledge of these six Chakras, from the contemplation of which he can aspire to attain to the stage of Samâdhi.

Major Basu concludes thus :

"This is an humble attempt on our part to identify these Chakras, and how far we have succeeded in our task, it remains for those who are abler, and more learned than ourselves to decide. It is passing strange indeed, that the three famous Nâdîs of the Tantras, *viz.*, Suṣumnâ, Idâ, and Pingalâ, which, there cannot be the slightest doubt, form the spinal cord, right and left sympathetic cords respectively, have not as yet been identified by any Orientalist. But we believe that as a Tantric work has been rendered into English, greater attention will be bestowed by Oriental scholars in illumining the dark recesses of the Tantric literature, and it is to be expected that within a not very distant date the Chakras, Vâyus, &c., of the Tantras will be more correctly identified."

2. *Osteology.*

The Hindu system of osteology, so far as human anatomy is concerned, which has been thoroughly investigated by Dr. Hœrnle in his learned '*Studies*

in the Medicine[1] *of Ancient India*' can be known from the following works[2] :—

A.—The System of Âtreya-Charaka :—

1. Charaka Saṃhitâ—Sarîrasthâna, VII adhyâya.
2. The Glosses of Chakrapâṇidatta.
3. Bheda Saṃhitâ—Sarîrasthâna, VII adhyâya.
4. The Non-medical version of Yâjnavalkya[3] (III, 84-90). (4th cent. A.D.)
5. The Commentary of Aparârka on „ (India Office MSS.) in 1150 A.D.
6. The Commentary of Vijnâneswara on „ („ „) in 1100 A.D.
7. The Commentary of Sulapâṇi on „ („ „) in the 15th cent
8. The Commentary of Mitramisra on „ („ „) in the 17th cent.
9. The Non-medical version in the Institutes of Viṣṇu[3] (200-400 A.D.)
10. *Vaijayantî*, or the Commentary of Nanda Pandita on Institutes of Viṣṇu, in 1622 A.D.
11. The Non-medical version in the Purâṇas[3]—(i) Agnipurâṇa (369th chapter), and (ii) Viṣṇudharmottarapurâṇa (Part of Garudapurâṇa) which has been quoted by Ballâla Sen in *Dânasâgara* (1100 A.D.)
12. The Non-medical version in the 'Anatomy'—the anonymous work called *Sarîram* (Tubingen University Mss.)

B.—The System of Susruta :—

1. Susruta Saṃhitâ—Sarîrasthânam.
2. Sarîra Padmini (Mss. in the possession of Dr. Cordiar).
3. Commentary on Sarîra Padmini by Vaidyanâtha.
4. Bhâvaprakâsa (Jivânanda's edition of 1875, pp. 40-41).

C.—The System of Vâgbhata I :—

1. Aṣṭânga Sangraha (Bombay, Vol. I, p. 244, ll. 3-13.)

D.—Miscellaneous Texts :—

1. Susruta and Vâgbhata on muscles—
   (*a*) Susruta Saṃhitâ—Sarîrasthâna, Ch. V, cl. 33.
   (*b*) Dallana's commentary extracted from Jivânanda's edition, p. 578.
   (*c*) Vâgbhata I, (Bombay) Vol. I, p. 225, ll. 20-21.
2. Susruta on Dissection.
3. Susruta on Homology in Sarîrasthâna, Ch. Vi, cl. 29.
4. Susruta and Vâgbhata on the Eye-ball—
   (*a*) Uttaratantra, Ch. I, verses 166, 17*a*.
   (*b*) Aṣṭânga Sangraha—Sarîrasthâna, Ch. V, Vol. I, p. 233, l. 10.
5. Bhoja on *nalaka* or reed-like bones, as reported by Dallana (Jiv., p. 576) and Gayadasa.

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[1] Published by the Clarendon Press, Oxford, 1907.

[2] See pp. 185-242.

[3] "The Law-Book of Yâjnavalkya is the original source of the non-medical version, from which it passed into the Institutes of Viṣṇu and into the two Purâṇas." Hoernle, p. 44.

6. Dallana on the aggregate ten (Jiv., p. 576)
7. Susruta and Vâgbhata on the number of *kurcha*.
8. Susruta and Vâgbhata on the number of ankles.
9. Susruta on the position of cluster and cluster-head.
10. Dallana, Gangâdhara and Nanda Pandita on the collar-bone.
11. Susruta and Vâgbhata on the position of scapula and clavicle.
12. Susruta on the number of scapula and clavicle.
13. Susruta on Amsakuta.
14. „ „ Amsapitta.
15. Râjanighantu and Amarakoṣa on Bhaga.
16. Susruta and Vâgbhata on Jatru and Grîvâ.
17. Susruta, Vâgbhata and Mâdhava on the Valmika disease.
18. Susruta on Urdhwajatru and Jatrurdhwa.

E.—The System of the Vedas:—

1. The Śatapatha Brâhmaṇa[1] on the Total Number of Bones and Bones in the Head and Trunk (X, 5, 4, 123; XII, 2, 4, 9-14).
2. The Śatapatha Brâhmana on Costal Cartilages (VIII, 6, 2, 7, 10).
3. The Atharva Veda on the Sekleton (*X*, 2, verses 1-8).

The 'wonderful structure of man' is thus described in the *Atharva Veda*[2] (X, 2):

"1. By whom were brought the two heels of a man? by whom was his flesh put together? by whom his two ankle joints? by whom his cunning fingers? by whom his apertures? by whom his two *uchlakhas* in the midst? who put together his footing (*pratiṣṭhâ*)?

"2. From what, now, did they make a man's two-ankle-joints (*gulpha*) below, his two knee-joints above? separating his two back-thighs (*janghâ*), where, forsooth, did they set them in? the two joints of his knees—who indeed understands that?

"3. There is joined, four-fold, with closed ends, above the two knees, the pliant trunk; what the hips are, the thighs,—who indeed produced that, by which the body became very firm?

"4. How many gods (and) which were they, who gathered the breast, the neck-bones of man? how many disposed the two teats? who the two collar-bones? how many gathered the shoulder-bones? how many the ribs?

"5. Who brought together his two arms, saying "he must perform heroism"? what god then set on his two shoulders upon the body?

"6. Who bored out the seven apertures in his head? these ears, the nostrils, the eyes, the mouth? in the might of whose conquest in many places quadrupeds (and) bipeds go their way.

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[1] Hoernle's *Indian Med.*, pp. 105-6.

[2] See the translation and notes in the Harvard Oriental Series, Vol. 8, pp. 567-72. Dr. Hoernle's translation on pp. 110-11 of his work differs slightly from this.

"7. Since in his jaws he put his ample tongue, then attached to it great voice; he rolls greatly on among existences, clothing himself in the waters: who indeed understands that?

"8. Which was that god who (produced) his brain, his forehead, his hind head, who first his skull, who having gathered a gathering in man's jaws, ascended to heaven?[1]"

Its composition is traditionally ascribed to Rişi Nârâyaṇa, author of the famous hymn on the sacrifice of man (called Puruṣa-sukta), perhaps also a medical man responsible for certain formulæ, *e.g.*, the recipe for the preparation of a medicated oil in Bower MSS. Part III.

3. *Varâhamihira.*

To the above survey of Hindu anatomical literature we should also add the non-medical treatment of the human body in LXVIII chapter of Varâhamihira's *Brihat Samhitâ*. This chapter on the physical features of man called *Puruṣalakṣaṇam*[2] begins thus: "A learned person shall examine a man's (1) Kṣetra (body), (2) Mrijâ (complexion), (3) Swara (voice), (4) Sâra (strength), (5) Saṃhati (joints), (6) Sucha (gloss), (7) Varṇa (colour), (8) Anuka (shape of the face), (9) Unmâna (height), (10) Mana (weight), (11) Prakriti (disposition), (12) Gati (gait) and then predict his fortune." We meet in this chapter with such terms of human anatomy as nails, heels, sinews, ankle, shanks, thighs, knees, loins, abdomen, sides, belly, navel, skin, nipple, bosom, collar-bones, neck, arm-pit, shoulders, arms, fingers, wrists, palm, thumb, fore-finger, chin, lips, tongue, face, ears, cheek, nose, eyes, brows, temples, head.

Appendix C.

4. *Dr. Seal on Hindu Physiology and Biology.*

For Seal's notes on Hindu Ideas about Nervous System of Tantras, Vital Force, Heredity, &c., see Appendices.

(*b*) *The Scientific Value of Hindu Anatomy.*

By a comparison of the Vedic osteological system with those of Âtreya-Charaka and Susruta, Dr. Hoernle proves:—

(1) The "system of the Atharva-Veda more nearly approaches the system of Âtreya-Charaka than that of Susruta;" and belongs to the "semi-mythical period of the history of Indian medicine." (circa 1000 B.C.)

(2) In the time of Yâjnavalkya, the traditional author of *Satapatha Brâhmaṇa*, who is said to have flourished at the court of Janaka, king of Videha, contemporary of King Ajâtasatru and Buddha, *i.e.*, about 500 B.C., "both the medical schools of Âtreya and Susruta were in existence;" and "he possessed some knowledge of their respective theories on the skeleton.

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[1] The remaining verses of the hymn refer to the 'numerous things dear and not dear,' ruin, pleasure, &c., and altogether give a complete picture of social, political and moral aspects of human existence.

[2] Sanskrit Text in the *Bibliotheca Indica* (Calcutta, 1855).

As for Vâgbhata's osteological system, Hœrnle proves that the principle on which his list of bones is constructed is "to take the list of Susruta as its basis and add to it such items of the list of Charaka as do not occur in it," and that it is really a "combination of the two."

The scientific value of Hindu anatomy would, therefore, depend on that of the osteological systems of the two principal schools of medicine. "According to modern anatomy,[1] there are about 200 bones in the adult human skeleton. The early Indian anatomists, on the other hand, count either 360 (Âtreya) or 300 (Susruta) bones. This large excess is principally due to the fact that (besides including the teeth, nails and cartilages) they counted prominent parts of bones, such as are known as 'processes' or 'protuberances,' as if they were separate bones." As for the difference in the systems of Charaka and Susruta, Dr. Hœrnle remarks :[2] "The statement of Dr. Wise (*Hindu System of Medicine*, p. 52) that the 'difference [between Susruta's total 300 and Charaka's total 360] is owing to their counting the cartilages with the bones' is hardly correct. Both writers include cartilages in their counts, though in different ways. The difference in their totals is mainly due to Charaka's counting the 32 sockets of the teeth as separate bones, and his including the 20 nails, neither of which are admitted in the count of Susruta."

In the third section of his work, that on the anatomical identifications, Hœrnle's verdict on the Hindu systems of osteology is given. He says: "The views of the early Indian anatomists are surprisingly accurate. This is due to the fact that they were accustomed to the practice of preparing the dead human body for actual examination, and that, therefore, their views were the direct result of an experimental knowledge of the skeleton. It is true that the compendium of Charaka contains no reference whatever to the practice of human dissection; and it must, therefore, remain doubtful whether, and to what extent, that practice was observed in the school of Âtreya. But there can be no doubt as to the practice being known and observed in the school of Susruta, for his compendium contains a passage[3] which gives detailed instructions regarding the procedure to be adopted in preparing a dead body for anatomical examination."

The following remarks from his Preface may also be quoted: "Probably it will come as a surprise to many, as it did to myself, to discover the amount of anatomical knowledge which is disclosed in the works of the earliest medical writers of India. Its extent and accuracy are surprising, when we allow for their early age—probably the sixth century before Christ—and their peculiar methods of definition. * * * No satisfactory knowledge of human anatomy can be attained without recourse to human dissection. * * * It is worthy of note, however, that in the writings of neither of these two oldest Indian medical writers is there any indication of the practice of animal

[1] Hœrnle, p. 115. The explanation for counting in this manner has also been given.

[2] P. 81.

[3] The passage occurs at the end of the fifth chapter of *Sarîrasthâna*, *vide* Hœrnle, pp. 116-117, 225-226.

dissection. The only mention of an animal subject is in connexion with training in surgery. Thus 'puncturing' is to be practised by the medical pupil 'on the veins of dead animals and on the stalks of water-lily,' similarly, 'extricating,' on the pulps of various kinds of fruits and 'on the teeth of dead animals.'

(*c*) *Propagation of Anatomical Knowledge in Hindu India.*

In ancient and mediæval India the knowledge of anatomy, whether elementary or advanced, was extensively diffused. There are reasons to believe that it was almost universal and not confined only within the circle of students and young men, called Brahmachâris, who received lessons in one or other of the various types of educational institutions. It was scattered broadcast through conventions, traditional usages, canons or rules of art and industry, social and religious practices, Tantric rites, and numerous popular ceremonies among the millions whose vocation in life was no nobler than what in terms of modern socio-ecomomic science may be grouped under (*a*) mechanical or automatic manual work, (*b*) responsible or intelligent manual work or even (*c*) mechanical or automatic brain-work.

The reasons are not far to seek. It is superfluous to remark that it is the numerous schools of Hindu medicine that have preserved and more or less developed the medical knowledge and literature of India through the ages. In every part of the country these have been the direct fountain heads of anatomical research and investigation, and have propagated through their professoriat and alumni, whose number has ever been considerable, the knowledge of the parts of the human (as well as animal?) body among the lay non-medical community at large. The importance attached by ancient Hindu thinkers to anatomical knowledge is to be gathered, however, from the provision they made for its inclusion in the curriculum of studies even for those scholars who would not specialise in Ayurveda. We are thus led to surmise that they wanted to make it an integral part of the liberal education of non-medical Brahmachâris also, and to form an estimate of the pedagogic theory that underlay their educational movements.

There is no doubt that, under the regulations of the Hindu Universities of ancient and mediæval India, a course of anatomy had to be offered by students of law (and social science), Theology as well as of Astronomy (and Astrology). The incorporation of anatomical chapters in some of the traditional text-books on Smriti Sâstras, Dharma Sutras, Purâṇas, Jyotiṣa, &c., and the commentaries on them by successive schools of scholars who were generally non-medical men, undoubtedly point to the facts—

(1) that even those who would not study Ayurveda did not go without a few lessons in anatomy (something like the 'short-term courses' in modern western Universities),

(2) that even non-medical men had sufficient knowledge of the subject to write commentaries on the medical topics in the treatises on Law, Sociology, Religion, &c.

(3) that the anatomical chapters of non-medical *Sâstras* corresponding to the anatomical primers and handbooks of modern times, had an important position in the literature of Hindusthan; and, as integral parts of social and religious works, which may be looked upon as more or less the *Encyclopædia Indicas*, found a place in every man's library.

We have already noticed in connexion with the survey of Hindu anatomy, what Hœrnle[1] calls the "Non-medical version" of Âtreya-Charaka's System of Osteology. This non-medical version is found (*a*) in two religious text-books, *viz.*, (1) *Viṣṇudharmottarapurâṇa* and (2) *Agnipurâṇa*, and (*b*) in two legal text-books, (1) *Yâjnavalkya Dharma Sâstra* and (2) *Viṣṇu Smriti*. There are certain particulars with regard to the incorporation of anatomical chapters in these works which point to the recognition of their importance to non-medical students by those responsible for it.

In the *Institutes of Viṣṇu* "the passage is in no way required by the context * * incorporated into the text from some other work." Hœrnle believes "the passage was inserted into the *Institutes* by some one who was familiar with the Mitâkṣarâ[2] commentary on the Law-Book." The prose statement in *Viṣṇu* is only a paraphrase and "otiose amplification" of the metrical section in *Yâjnavalkya*. Again, a comparison of the 369th chapter, called *Sarirâvayavah*, or Parts of the Human Body, in the *Agnipurâṇa* with the chapter on Anatomy in the *Viṣṇudharmottarapurâṇa* shows that about two-thirds of its contents are "literally plagiarised from it." "The Law-Book of Yâjnavalkya is the original source of the Non-medical version, from which it passed into the *Institutes of Viṣṇu* and into the two Purâṇas."

Without entering into a discussion of the differences in the anatomical knowledge displayed in these non-medical treatises, it would be sufficient for our purposes to remark that the tendency of incorporating medical chapters with non-medical works.

(1) began as early as at least the 4th century A.D.), when Yâjnavalkya, author of the celebrated Smṛiti, is supposed to have flourished;

(2) that it has been kept up by latter-day professors of Theology and Sociology, *e.g.*, (i) in the Viṣṇudharmottara (at least as early as 1100 A.D.), (ii) in Viṣṇu Smṛiti (at any rate before 1622[3] A.D.) and (iii) in the Agnipurâṇa (at the latest 1650 A. D.);[3]

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[1] Pp. 40-46.

[2] "Whoever drew up the list as we find it in the *Institutes*, did so on the basis of Vijnâneswara's interpretation; and accordingly the introduction of that list in the *Institutes* cannot be placed earlier than the date of Vijnâneswara, that is after 1100 A.D. Seeing that the *Institutes of Viṣṇu* appears to be often quoted in the Mitâkṣarâ, it does not seem impossible that the appearance of the list in the *Institutes* is due to Vijnâneswara himself." Hœrnle, pp. 59-60

[3] These dates refer to the introduction or interpolation of the anatomical chapters in the works, not to the general body of the works themselves.

and (3) that it has been preserved by the efforts of successive schools of lay commentators to explain the medical ideas, according to the culture of the ages in which they lived, *e.g.*, (i) Vijnâneswara (Mitâkṣarâ, c. 1100 A.D.), (ii) Aparârka, who though a near contemporary of Vijnâneswara (1150), holds an independent view in the interpretation of Yâjnavalkya, (iii) Sulapâṇi (15th cent.) and (iv) Mitra Misra (17th century), both following the lead of Vijnâneswara.

The same conclusion is arrived at by the fact that a small manuscript, called *Sarira*,[1] or anatomy, has been discovered in the collection preserved in the Tubingen University Library. Its age and author are unknown. Its versified contents are compiled from many different sources, some of which are quoted by name, *e.g.*, Charaka, *Yogamuktâvali*, *Kaulâvali*, &c. Its statement on the Skeleton is taken from the Law-Book of Yâjnavalkya, though the source is not named. But an important error of Yajnavalkya "was detected and corrected by the unknown author of the *Anatomy*."

The extract from the *Brihat Saṃhitâ* quoted previously also points to the intimate association of anatomy with general Hindu literature and its place in the scheme of education in *Jyotiṣa* (which is not equivalent to what in modern times is called Astronomy, but includes Astrology, Mathematics and many other topics of a social and economic nature). From the very definition of the scope and province of Jyotiṣa and of its three branches—*Horâ*, *Tantra* and *Anga-vinischaya*—as well as the description of the Jyotiṣaka,[2] or the man versed in Saṃhitâ, Astronomy, and Horoscopy, it would be clear that at least such knowledge of anatomy, physiology, and embryology, as furnishes a working idea of the parts of the body, the nativity, external features of man and animals, is an essential item in the equipment of the students of this science.

From considerations like these relating to the scope of Hindu literature on non-medical subjects we are reasonably led to believe that in ancient and mediæval India no Hindu Brahmachâri was left without the knowledge of a little anatomy; and that the references to limbs or features of human or animal life that we meet with in poetical works, Silpasâstras, Tantras, sacrificial and religious catechisms, or allegorical, moral and didactic treatises are not due to commonplace observations that may be expected of the man in the street, but presuppose, in the absence of evidences to the contrary, the education received by the poets, priests, moralists, story-tellers, scientists and scholars, in their *Brahmacharya Âsram*.

It is this universality of the anatomical instruction imparted by the *gurus* or professors to their pupils which explains the popularisation of knowledge about parts of the body among the community, and its influence on the arts and industries designed to imitate or reproduce human beings or animals. It is this, again, which has left its mark on the Theory and Philosophy of Hindu Art including Architecture, Sculpture and Painting. The 'masters' are very strict in their injunctions that the sculptors and painters should follow with

[1] Hœrnle, pp. 61-622-67.

[2] See the first two chapters of *Brihat Saṃhitâ*.

religious and mathematical accuracy, the anatomical measurements laid down by them regarding the construction of images of gods and their *vâhanas* or conveyances or symbols.

These canons of Hindu art prove (1) a thorough knowledge of anatomy on the part of the promulgator and (2) their desire to perpetuate and propagate, through more or less durable embodiments, the national ideals of beauty in art as consisting in the closest conformity of artists with the specimens of symmetry and order exhibited by Nature in her great museum of the living universe. Once presented in art, the canons became conventional and have been traditionally followed by sculptors, painters, artists and craftsmen, even by those among them who had not received theoretical or demonstrational lessons in anatomy at schools, from books or from professors. And, besides satisfying the spiritual sense of generations of devoted spectators, both educated and illiterate, these images and works of plastic and other arts have served for them the double purpose of anatomical models as well as object-lessons in æsthetic perfection;—being at once the national schools of religious, secular and artistic education and culture.

(*d*) *Human Anatomy in Sukranîti.*

The Sukra authors must have had adequate knowledge of human and animal anatomy, as is evident from their care in noting, according to the injunctions of specialists in art-literature, the features of the body in the section on images of gods, and also the external characteristics of animals in the treatment of the economic topics connected with them. The names of the parts of the human body, and their measurements according as the images are to be 7, 8, 9, 10 or 12 *tâlas* (feet) high, will be described in the chapter on the Data of ancient Indian art. Here we shall mention the anatomical features described by Sukrâchâryya in the section on the animal-force of the Hindu state.

(*e*) *External Anatomy of Horses, Elephants, &c.*

It is only the horse that has been fully described in *Sukranîti*. The Sukra authors have given the measurements of the limbs of horses, most probably, as it would appear, to help sculptors in their art. For say they: "If an image[1] is to be made, the appropriate pattern or model should always be placed in front. No image can be made without a model. So the artist should frame the limbs after meditating on the horse, and finding out the measurements and attributes of horses in the manner indicated above." The place of animal-anatomy in Hindu art is quite clear from this extract. But Sukrâchâryya intends these measurements to be remembered also by non-artists, *i.e.*, lay men, whether merchants or rulers or warriors in their sales and purchases of horses.

The general remarks on the quality of horses as known from the proportion between the parts of their body are given in IV, vii, 85-95.

[1] Sukra IV, vii, 145-47.

We have to remember two things about horse-measurements :—

(1) 5 yavas = 1 angula.

(2) The limbs of horses are to have a fixed proportion to the face.

The quality of horses is indicated thus :—

The best horse has a face of	24	angulas.
Second class „ „	36	„
Third class „ „	32	„
Inferior or ordinary „	28	„

Ordinary horse-measurements are given below :—

Height or stature	3	faces.
Length	4½	„
Girth	3+3	angulas.

The following are the measurements of the 28 angula-type of Horses :—

(*i*) *Heights.*[1]

1.	Heel or hoof (*Śapha*)	3	angulas.
2.	Ankle-joint or fetlock (*Manivandha*) ...	4	„
3.	Foreleg or shanks (*Janghâ*)	20	„
4.	Knee (*Jânu*)	3	„
5.	Fore-thigh or elbow (*Uru*)	14	„
6.	Thigh to neck	38	„
7.	Hind thighs (*Uru*)	28	„
8.	Hind legs (*Janghâ*)	21	„
9.	Neck[2]	18	„

(*ii*) *Lengths.*[3]

1.	Neck (Grivâ)	60	angulas.
2.	Body (from end of neck to organ) ...	60	„
3.	From organ to end of vertebral column...	18	„
4.	Tail (*Puchchhadanda*)	14	„
5.	Genital organ	14	„
6.	Testicles	14	„
7.	Ear	6, 4 or 5	angulas
8.	Mane or hair of neck[4]	1	cubit.
9.	Hair of tail[5]	1½ or 2	cubits.
10.	Eye[6]	3 or 4	angulas.

(*iii*) *Circumferences.*[7]

1.	Heel or hoof	15	angulas.
2.	Ankle-joint	7½	„
3.	Foreleg or shanks	7½	„
4.	Fore-thigh	11	„
5.	Hind thigh	88	„
6.	Hock of the ankle-joint	9	„
7.	Hind leg	7½	„

[1] Sukra IV, vii, 96-101.
[2] Sukra IV, vii, 103-108.
[3] Sukra IV, vii, 104.
[4] [5] [6] Sukra IV, vii, 118-122.
[7] Sukra IV, vii, 109-115.

8.	Forepart of neck [1]	...	...	32 „
9.	End of neck [2]	...	...	46 „
10.	Forehead [3]	...	...	36 „
11.	Face at the nose below the eye [4]		...	19 „

(iv) Distances, breadth, width or space.

1.	Between two thighs at the back	... 1 angula.
2.	The neck on which hair grows	... 1½ „
3.	Ear	... 3 or 4 angulas
4.	Breast	... 19 „
5.	Eye	... 2 or 2½ „
6.	Between two thighs	... 9 „
7.	„ „ eyes	... 5 „
8.	„ „ ears	... 5 „
9.	„ eye and ear	... 5 „
10.	„ two heels	...6, 7, &c. „
11.	„ two pupils of eyes	... 9 „
12.	„ „ eye-brows	... 9 „
13.	„ eye and nose	... 9 „
14.	„ two nostrils	... 3 „
15.	„ arms at breast	... 4 „
16.	Lower lip	... 1½ „
17.	Upper lip	... 9 „
18.	Between back and breast	... 1¾ cubits.

About Elephants the following measurements are given in IV, vii, 77-84.

[*N. B.*—8 yavas = 1 angula
24 angulas = 1 cubit.]

	Bhadra.	Mandra.	Mriga.
Height ...	7 cubits.	6 cubits.	5 cubits.
Length ...	8 „	8 „	7 „
Girth ...	10 „	9 „	8 „

About Bulls Sukra authors record the following measurements in IV. vii, 299-302 :—

Girth = 4 times face.
Height+hump = 3 „
Length = 3½ „

The best animal has 7 *tâlas* or feet in height.

The good height of camels is known to be 9 *tâlas* or feet.[5]

(f) Dentition and Age of Animals.

The following table gives the duration of the periods of youth,[6] manhood and old age, as applied to the five principal vertebrates :—

	Maximum age.	Youth.	Middle age.
Man	... 100 years.	20 years.	60 years.
Elephant	... 100 „	20 „	80 „
Horse	... 34 „	5 „	16 „
Bull	... 25 „	5 „	16 „
Camel	... 25 „	5 „	16 „

[1] [2] [4] Sukra IV, vii, 124-128. [5] Sukra IV, vii, 304-5. [6] Sukra IV, vii, 306-313.