

CHAPTER XXXII.

THE CAT'S PLACE IN NATURE: ITS ANCESTRY, CLASSIFICATION, STRUCTURE, AND DISTRIBUTION.

AT a very remote period in the history of animal life when the struggle for existence was rife, the carnivorous and predaceous animals (to which the existing cat belongs) occupied a position in the scale of creation as important as the one they hold today. We find locked up in the rocks of the tertiary and recent pleistocene formations the bones and teeth of these ancient cats along with those of the animals upon which they lived.

These ancestors of our cat had a tolerably wide geographical distribution, and they apparently differed considerably in size, as do the different members of the existing cat family. The crested cat (*F. crestatata*) was probably as large as a tiger—more recent remains having a closer affinity to existing cats are found plentifully in caves and in the deeper beds of rivers and lakes almost all over the British Islands.

Probably the most remarkable of these extinct cat-like creatures is the *Machærodus*, the skulls of which (Fig. II.), with portions of its skeleton, associated with the bones of other animals, have been found in the cave

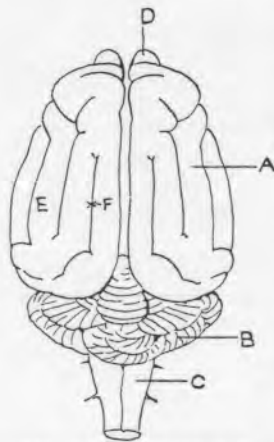


FIG. I.—BRAIN OF CAT.

A, Right hemisphere of cerebrum; B, Cerebellum; C, Medulla oblongata; D, Olfactory bulb (nerve of smell); E, Convolution, or Gyrus; F, Fissure.

deposits in Brazil, North and South America, India, Persia, many parts of Europe, as well as in the British Islands—viz. Kent's Cavern,

Creswell bone caves, and other places. The skull, which is very typical and cat-like in form, is remarkable for the extraordinary development of the upper canine teeth, which in some species exceed seven inches in length. The *Machærodus* was about the size of a lion.

The ancestors of our cat were certainly more specialised in parts of their organisation. The nearer we approach the recent forms a greater uniformity in structure prevails, until we get in the existing cat-like group (*Felis*) probably the most consolidated and uniform of all the generic mammalia.

FAMILY CHARACTERISTICS.

Under the generic title of *Felis* are included over fifty-one distinct species, of which the lion, tiger, leopard, puma, and our common domesticated cat may be taken as representative. They inhabit every region on the earth's surface, except the extreme northern latitudes, and vary in size from the tiger and lion to the little red-spotted cat of India, which does not exceed fifteen or sixteen inches in length. But it is, as already indicated, very uniform in order as regards structural points. All have well-developed, retractile claws, the only exception being the cheetah, whose claws are only partially retractile; all have five toes on the fore feet, and four on the hind feet; all the teeth are cusped, or pointed, and specialised for flesh-eating, as well as for aggressive purposes. The incisors in front of the upper and lower jaws are small, the four canines well grown and long, with a cutting edge on the inner side; the molars, or cheek teeth, have one to five cusps, points, or lobes. All the members of the family are *digitigrade* (*i.e.* use only the extremity of the toes in walking); the tympanic bulla, or ear-bone, is large and prominent; the general form of

the skull is rounded and broad across the orbits, or eye-sockets (the latter are, with two exceptions, open or incomplete behind); the clavicle, or collar-bone, is reduced to a short, curved, splint-like bone; in many species it is absent.

The stomach is always simple, intestines relatively short, tongue covered with minute spines. In many species the pupil of the eye contracts in one direction only, thus giving it a *linear* and upright form. The majority of the species are nocturnal; the habits of the genus are very diverse. The lion apparently prefers the drier, sandy areas covered with short, scrubby vegetation; others prefer the dense forests, and live much in the trees. Many species are found at considerable altitudes, the snow leopard being found at 18,000 feet. All the members of the group can swim, and several species (*i.e.* the fishing cat of India and Southern China) are adepts at catching fish, but immersion is invariably avoided.

The colours of the different members of the genus *Felis* vary considerably. It may be a uniform, tawny, pale brown, or a grey—as in the lion, puma, eyra. The tiger is striped transversely; the ocelot has bands or rows of more or less fused spots; the serval and several other species have solid black spots; the leopard, clusters of spots, forming a kind of star; the jaguar has the spots arranged in an open ring. In the clouded leopard of Southern India the markings are composed of irregular groups of lines and spots, merging into the ground colour of the animal's coat. A black variety of the common leopard is occasionally found in a wild state. Albinos, or white forms, are extremely rare in nature, though quite common in the domesticated cat.

GENERAL STRUCTURE OF THE CAT.

The natural food of all the cat tribe in a state of nature is carnivorous, and the whole organisation of the group is specialised and adapted for aggressive or, if need be, defensive purposes. The body is compressed laterally, and has a considerable amount of flexibility in it as a whole.

The bony framework or *skeleton* is light, and, for the purpose of an elementary description, is readily divisible into three parts—viz. (1) the skull; (2) the axial skeleton, comprising the bones of the neck, thorax, loins, and tail; (3) the appendicular skeleton or limbs. The skull is short, rounded, and broad across the orbits or eye-sockets, which are large in proportion to the skull. The posterior rim of the orbit is, with three exceptions, out of the fifty-one species—viz. the fishing-cat (*F. viverrina*), the rusty spotted cat (*F. rubiginosa*), and the flat-headed cat (*F. planiceps*)—incomplete or open. The *teeth* of the fully adult cat should be thirty in number—sixteen in the upper jaw and fourteen in the lower. They are divided by the comparative anatomist into three sets or groups—viz. incisors, canines, premolars, and molars—their number and position being concisely expressed by a dental formula thus:— $1\frac{3}{3}$, C. $\frac{1}{1}$, PM. $\frac{3}{3}$, M. $\frac{1}{1}$. The six incisors in the upper and lower jaw are small, simple-pointed teeth, with a simple fang or root. Then we have a long canine or flesh tooth CC: the most important functional tooth the cat

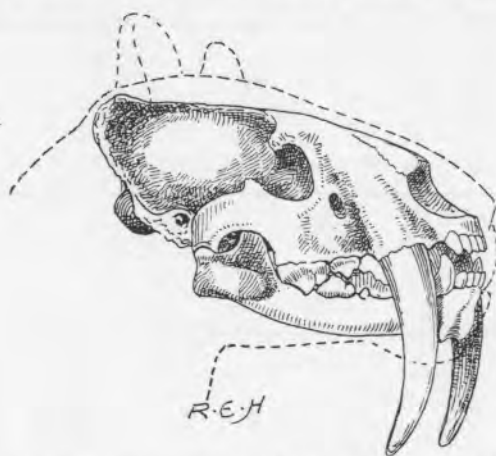


FIG. II.—SKULL OF THE GREAT SABRE-TOOTHED CAT. FROM THE CAVES OF BRAZIL. (*Macharodus Neogausi*.)

has, for with it and its fellow the living, struggling prey is seized, retained, and killed.

In the upper jaw, immediately after the

canine, are three premolars PM. These are the second or permanent series, and succeed the kitten's milk-teeth. The first one is very small, and has only a single cusp; the second is larger, and has two cusps; the third is the largest, and is sometimes called the "sectorial" tooth. It has three pointed cusps and three fangs, or roots. Immediately behind it, and placed somewhat transversely, is the single true molar. It is a small tooth, of

The *Axial Skeleton* (see p. 354) consists of the bones forming the neck, thorax, loins, and tail. The neck is relatively short, and consists of seven bones—a number almost constant throughout the animal kingdom, the giraffe, the hippopotamus, and the whale having the same number. Succeeding these are the *dorsal*, or *thoracic*, vertebræ (thirteen in number), each one supporting two ribs—one on each side. Then follow the seven vertebræ

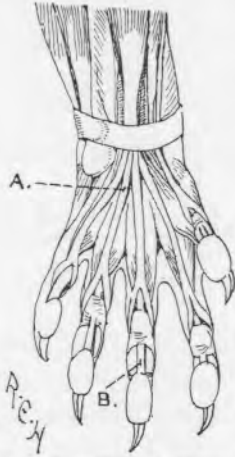


FIG. III.—SUPERFICIAL FLEXOR TENDONS OF THE CAT'S LEFT FORE-FOOT

A, Perforatus, or *flexor sub-digitorum*; B, Perforans, or *flexor profundus digitorum*.

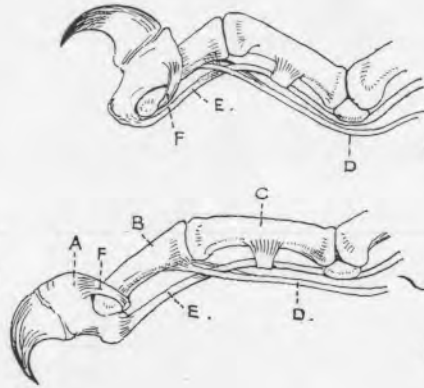


FIG. IV.—BONES AND PRINCIPAL LIGAMENTS OF A CAT'S TOE, SHOWING MECHANISM OF RETRACTILE CLAW.

A, Distal or terminal phalanx; B, Middle; C, Proximal; D, Perforatus tendon; E, Perforans tendon; F, Elastic ligament.

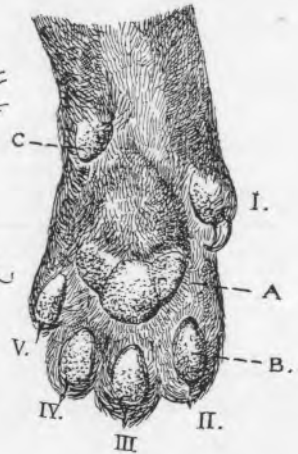


FIG. V.—PADS OF CAT'S LEFT FORE-FOOT.

A, Plantar pad; B, Digital pad; C, Pisiform pad.

obtuse form, and indefinitely cusped; it has no predecessor in the kitten's milk set.

In the lower jaw, immediately after the canine tooth, there are only two premolars (PM. PM'.) in the permanent set which have predecessors, the last tooth (M.) being the only true molar, and having no predecessor in the milk set. Occasionally, in the lower jaw there is a small premolar corresponding to the first premolar of the upper jaw. In the kitten from about six or seven weeks to about five months old, there are only twenty-six teeth, the number and form being very similar to the adult set. The two permanent molars in the upper and lower jaw are absent.

composing the *lumbar* region. They are stout, thick bones, with long, transverse processes for the attachment of certain muscles supporting the body cavity, etc. No ribs are attached to these bones. Immediately behind are three smaller bones forming the *sacrum*, to which the pelvis, or hip-bones, are articulated. The terminal bones of the axial skeleton are the tail, or caudal, and vary from nineteen to twenty-one.

The *Ribs* (thirteen on each side) are extremely light, elastic, and slender. Nine of these on each side join the sternum or breast-bone directly, and are called true ribs; the remainder are free, and terminate in cartilaginous

points, which are adherent to the true rib terminations, for support.

The *Sternum*, or breast-bone, consists of eight bones, from each joint of which springs a rib-like costal cartilage, to which the true ribs are articulated. The cat's collar-bone or clavicle is very short and rudimentary; it has a slight attachment to the acromion process of the scapula, the other end terminating in the muscles of the chest. It is often absent.

The *Appendicular Skeleton* includes the fore and hind limbs. The fore limb in the cat, as in the majority of mammals (*see* plate, p. 355), is a subtriangular flat bone, with a ridge on the outer side for the attachment of certain muscles moving the leg.

In a small hollow on the posterior or lower border is articulated the head of the *humerus* (4), or arm-bone; its lower or distal end is expanded, and receives the end of the *ulna* (10), which with the *radius* (9) forms the bones of the forearm. The wrist or carpal bones (8) include seven small bones, the upper row being attached to the radius, the lower row to the five phalanges of the toes (7); to articulated the bones of the



FIG. VI.c.—CAT'S SKULL FROM BELOW, WITHOUT LOWER JAW, SHOWING PALATAL SURFACE.



FIG. VI.b.—CAT'S SKULL, SIDE VIEW, WITH LOWER JAW IN PLACE.

these latter are digits, or fingers.

The terminal bones of the cat's foot are encased by powerful hooked claws (Fig. III.). When at rest, the claw is brought to the outer side of the middle phalanx by the elastic ligament F, the flexor tendons being relaxed. When the cat is on the point of

seizing its prey, the greater power of the flexor tendons stretches the weaker elastic ligament, the claw is brought down, and so a powerful grip is obtained. The under-surface of the cat's fore and hind feet is protected by certain hardened pads of subcutaneous and fibrous tissue—viz. the



FIG. VI.a.—CAT'S SKULL" VIEW FROM ABOVE.

plantar pad, giving chief support to the leg, and the digital pads protecting the claws, etc. These pads are, of course, of additional use in aiding the cat's noiseless and stealthy progression.

The cat's hind limb is articulated by a ball and socket joint to the hip-bone or pelvis (20), which is again firmly united to the three bones forming the sacrum D. The thigh-bone or femur (19) sustains the whole body, and has many powerful muscles attached to it concerned in the springing movements so characteristic of the animal; to its lower end is articulated the principal bone of the lower leg, the tibia (13). At the union of these two bones on the anterior side is the knee-cap, or patella (12). On the outer aspect of the tibia is a slender bone, the fibula (18), its outer end being attached to a prominence on the tibia, the lower end to one of the large bones (the astragalus) which form the tarsus of the foot.

The *Tarsal* bones (14) consist of seven bones, the largest of which is the os calcis (17), or heel-bone, to which powerful muscles are attached. Succeeding the tarsal bones are the four bones forming the metatarsal bones (the fifth or inner toe being absent, though often

present in the dog). To these are attached the phalanges of the toes, with the claws, etc., similar to the fore foot.

A better idea of the superficial muscles of the cat is obtained from an examination of the plate than by any technical description. It

lives too much in the lap of luxury for them to attain to a proportionate development.

A well-known writer has estimated that there are 500 muscles concerned in the movements of the cat's body.

The cavity of the cat's body is separated

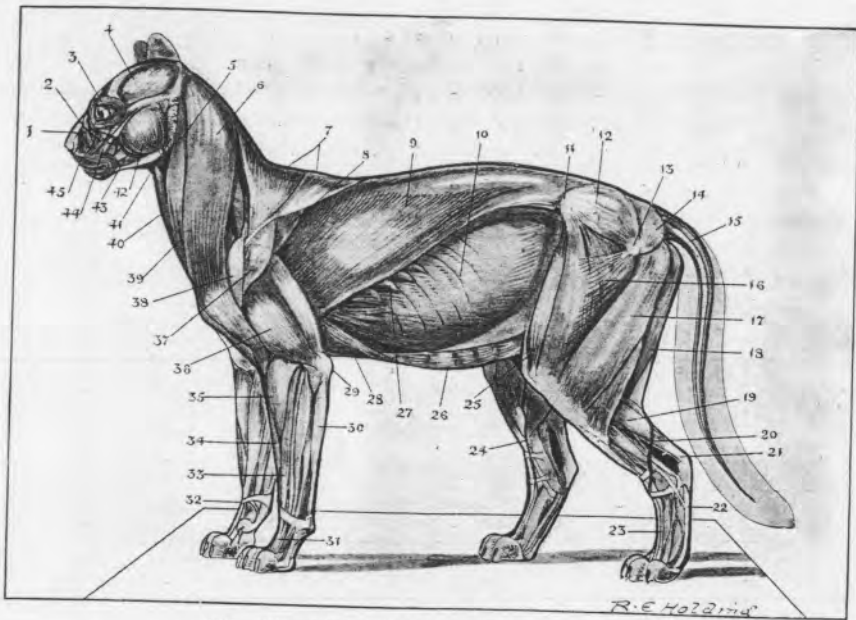


FIG. VII.—SUPERFICIAL MUSCLES OF A CAT.

- | | | |
|---|--|------------------------------------|
| 1.—Maxillaris. | 16.—Fascia lata covering deeper muscles. | 30.—Flexor carpi ulnaris. |
| 2.—Caninus, or Nasalis. | 17.—Biceps femoralis. | 31.—Superficial Extensors of Toes. |
| 3.—Orbicularis. | 18.—Semi-tendinosus. | 32.—Annular or Wrist Ligament. |
| 4.—Temporalis. | 19.—Gastrocnemius. | 33.—Extensor communis digitorum. |
| 5.—Mastoideus. | 20.—External Saphenous Vein. | 34.—Flexor carpi radialis. |
| 6.—Cephalo-humeral. | 21.—Point of Heel, or Os Calcis. | 35.—Extensor carpi radialis. |
| 7.—Posterior and anterior portions of | 22.—Plantar or Flexor Tendons of Sole of | 36.—Triceps. |
| 8.—Infraspinatus. | Foot. | 37.—Scapular deltoid. |
| 9.—Latissimus dorsi. | 23.—Extensor Tendons of Toes. | 38.—Acromion deltoid. |
| 10.—Great Oblique. | 24.—Internal or Inner Saphenous. | 39.—Mastoideus. |
| 11.—Prominence of Hip-bone. | 25.—Sartorius. | 40.—Sterno-hyoid. |
| 12.—Gluteus medius. | 26.—Rectus abdominis. | 41.—Parotid Gland. |
| 13.—Prominence of Thigh-bone, or Femur. | 27.—Serratus magnus. | 42.—Masseter Muscle. |
| 14.—Gluteus maximus. | 28.—Pectoralis major. | 43.—External Maxillary Vein. |
| 15.—Muscles concerned in the movements | 29.—Elbow, or Olecranon Process of | 44.—Zigomaticus. |
| of the Tail. | Ulna. | 45.—Zigomaticus labialis. |

will be seen that for its size the cat's muscles are well developed; its kin, the lion and tiger, are known for their prodigious strength in bearing away young oxen, deer, antelopes, etc., upon which they live, as well as for their leaping powers and agility and courage.

Although the cat's muscles are identical with those of its more powerful relatives. it

into two unequal compartments by a muscular partition called the midriff or diaphragm. In the anterior or foremost cavity are the two lungs, and the heart and its blood-vessels; in the larger or most posterior compartment is the stomach, intestines, liver, kidneys, etc. Without a considerable number of diagrams it is difficult to convey in a popular manner

some peculiarities of these internal organs. The cat's tongue (Fig. x.) is, however, very characteristic of the order, and is easily observed. It is supplied with the usual glands common to all mammals—viz. tonsils (B), flattened soft papillæ (C), four circumvallate papillæ (D), conical papillæ (E), and the more

complicated appearance as compared with the simpler livers of other animals. The gall-bladder is present in the usual position. The cat's heart is somewhat small for the size of the animal, and is not so pointed at its apex as in other animals; the veins entering the heart, and the branching of the arteries leaving

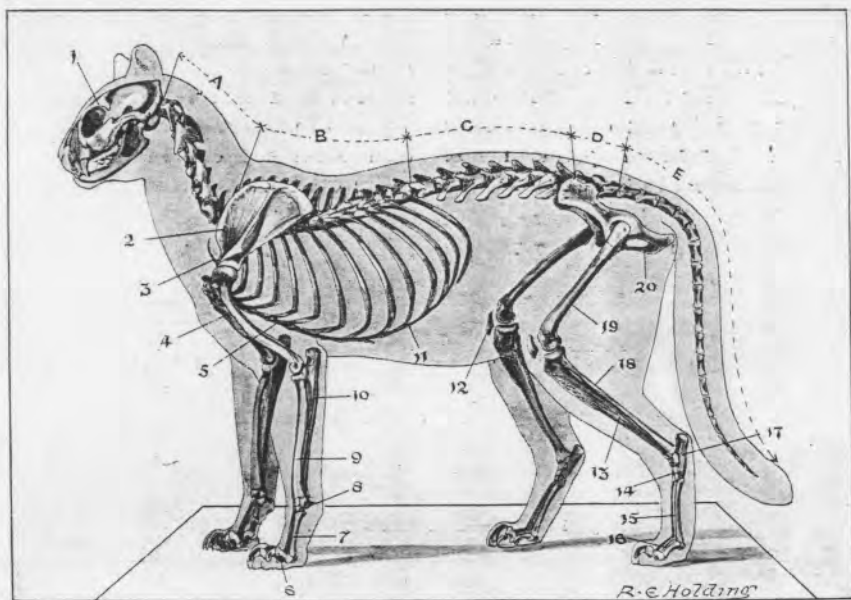


FIG. VIII.—SKELETON OF A CAT.

A. CERVICAL OR NECK BONES (7 in number). B. DORSAL OR THORACIC BONES (13 in number, each bearing a rib). C. LUMBAR BONES (7 in number). D. SACRAL BONES (3 in number). E. CAUDAL OR TAIL BONES (19 to 21 in number).

- 1.—Cranium, or Skull.
- 2.—Scapula, or Shoulder-blade.
- 3.—Clavicle, or Collar-bone.
- 4.—Humerus.
- 5.—Sternum, or Breast-bone.
- 6.—Phalanges of the Toes.
- 7.—Metacarpal Bones.

- 8.—Carpal or Wrist-bones.
- 9.—Radius.
- 10.—Ulna.
- 11.—Costal cartilages, uniting ends of Ribs to Sternum.
- 12.—Patella, or Knee-cap.
- 13.—Tibia.

- 14.—Tarsal Bones.
- 15.—Metatarsal Bones.
- 16.—Phalanges of Hind Toes.
- 17.—Heel-bone, or "Calcis."
- 18.—Fibula.
- 19.—Femur, or Thigh-bone.
- 20.—Pelvis, or Hip-bone.

minute fungiform papillæ (F). The peculiarity of the cat's tongue is that the conical papillæ are specialised into horny processes or hooks, as shown in E F, and are of value not only in assisting to clear the flesh from bones, but are of undoubted use in cleaning the animal's fur. The cat also has the parotid, sublingual, and other glands concerned in the preparation of the food for primary digestion.

The cat's liver is mainly on its right side; it is divided into several lobes, which give it a

it, are nearly identical with those of closely allied animals. The time required for the complete circulation of the blood throughout the body of the cat is fourteen to sixteen seconds. The pulse, each beat of which corresponds to one contraction of the left ventricle of the heart, may easily be felt on the inner side of the fore-paw, about an inch above the prominence of the radius; it may also be felt at the same place as the horse's pulse—on the inner side of the lower jaw. There are two

other situations on the cat's body where it may be felt, but to find the exact point requires some intimate anatomical knowledge. The temperature, or normal heat, of the body of the cat is 100° F.; it may, however, be slightly above or below this.

The brain of the cat, following the general structure of the higher mammals, is divided into very similar areas or divisions. The larger or more anterior portion is called the cerebrum (Fig. I., A), and is divided into right and left hemispheres. Its surface is divided into convolutions or gyri (E) by certain shallow fissures, which have received specific names. Very intimately attached to the under-surface

In all the higher mammals the eye can accommodate itself to the varying influence of light. This is mainly done by means of the central black part or pupil (Fig. IX., A). The pupil is merely a hole in the iris, or coloured part of the eyeball (B), and it is by its contraction or expansion that the exact amount of light necessary is admitted to act upon the sensitive retina at the back of the eye. The form of the pupil varies considerably in different animals. In the cat's eye during bright sunshine it is reduced to a thin vertical line; at dusk it expands to a nearly circular form. This vertical reduction is by no means common to the entire cat family. In very many species the

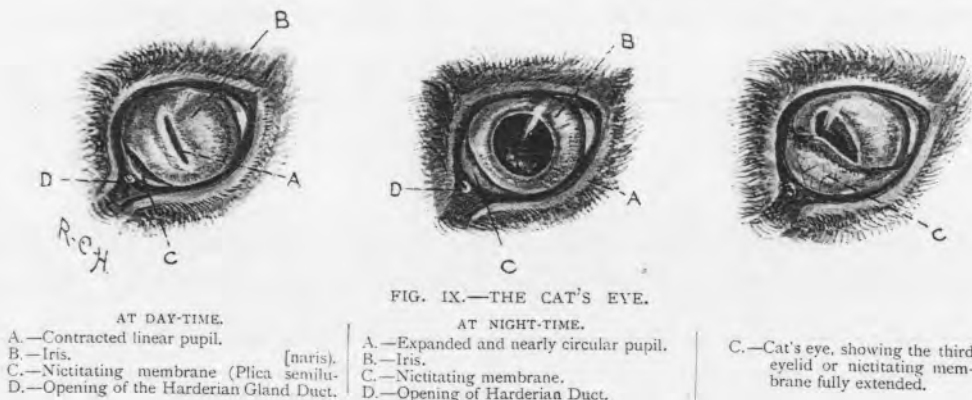


FIG. IX.—THE CAT'S EYE.

AT DAY-TIME.

- A.—Contracted linear pupil.
 B.—Iris.
 C.—Nictitating membrane (Plica semilunaris).
 D.—Opening of the Harderian Gland Duct.

AT NIGHT-TIME.

- A.—Expanded and nearly circular pupil.
 B.—Iris.
 C.—Nictitating membrane.
 D.—Opening of Harderian Duct.

- C.—Cat's eye, showing the third eyelid or nictitating membrane fully extended.

of this part of the brain are the olfactory lobes (D), in which are situated certain nerves concerned in the sense of smell. The hinder and smaller part of the brain is called the cerebellum (B), and is much darker in colour than the cerebrum. Its surface is made up of numerous small foldings of its substance, which, on section, look like the branches of a small tree; these branches finally fuse and terminate on the under-side of the base of the brain.

Intimately associated in a most complex manner with the cerebrum and cerebellum is the medulla oblongata (C), an enlarged part of the spinal cord. The brain of the cat, it may be remarked, is not nearly so highly organised as that of the dog.

pupil retains a rounded form even when contracted to its minimum.

On the inner angle of the cat's eye there is a curious semi-transparent fold of skin, called by naturalists the plica semilunaris, or nictitating membrane. In reptiles and birds this is a very important factor in the preservation of the eye from external injuries, and it acts also as a regulator of the admission of light. It is well developed in nocturnal reptiles and birds, and as the cat's ancestors were doubtless more nocturnal than they are now, it probably was in active use. It is, however, useless now, the cat having no control over it. It is one of many interesting vestigial structures the cat carries about with it of its former ancestry from a lower-organised animal.

THE DISTRIBUTION OF THE CAT FAMILY.

Long-continued and systematic study of the habits of living animals has led to the division of the surface of the world into specific areas, called Zoogeographical regions, of which there are six—viz. (1) Palearctic region; (2) Ethiopian or African region; (3) Oriental or Indian region; (4) Australian region; (5) Nearctic or North American region; and (6) Neotropical or South American region. The cats of the Old World and of the New World are, with the exception of the debatable northern lynx, specifically distinct. No native cats exist in Australia.

The Palearctic region comprises the whole of Europe, part of North Africa, and extends eastward to Kamtchatka, and includes the islands of Japan. There are about twenty-one known species of the cat family inhabiting this extensive area, the best-known being the tiger, which is found in Mongolia; the common leopard, widely distributed in Southern Siberia; the snow leopard, wild cats, the lynx, and many others. The Ethiopian or African region includes the whole of the continent of Africa up to the tropic of Cancer, and the greater part of Arabia and Madagascar. About nine species

are known to inhabit this region. The best-known are the lion, leopard, serval, Egyptian cat, caracal lynx, and cheetah. The Oriental or Indian region includes a strip of southern

Persia, the whole of India, China, and the Malay peninsula, Borneo, and other islands of the East Indian Archipelago. There are about sixteen species inhabiting this region. The best-known examples of the cat family here are the lion (inhabiting the southern portions of Persia), tiger, leopard, cheetah, clouded leopard, and a great variety of the smaller species.

The Nearctic or North American region includes Greenland and the whole of the continent of North America down to Mexico City and Vera Cruz. There are only seven indigenous species of the cat family, the best-known being the puma, which also extends into the neotropical region, the northern and the bay lynx.

The Neotropical or South American region extends from Vera Cruz in Central America, through the whole of South America to Patagonia. About thirteen well-marked species of the cat family inhabit this region. The better-known species are the puma, jaguar, ocelot, margay, pampas cat, and the curious eeyra.

ROBERT HOLDING.

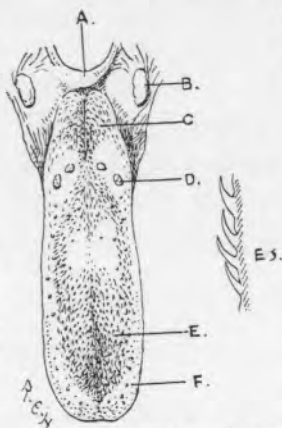


FIG. X.—SURFACE OF THE CAT'S TONGUE.

- A.—Epiglottis or upper cartilage of windpipe.
 B.—Tonsil.
 C.—Flattened or soft papillae.
 D.—Circumvallate papillae.
 E.—Horny conical papillae.
 E.I.—The same enlarged.
 F.—Fungiform papillae.