

THE PURRING CREATURE THAT WALKS ON ITS TOES

BY PATRICIA TURNER

PART ONE - THE EVOLUTION OF THE DOMESTIC CAT

The kingdom of animals can be considered as a series of progressively increasing complexity, and evidence supporting evolution is available from many sources. Perhaps surprisingly one of these is that of natural classification. All household cats are regarded as members of a single species *Felis catus* and the use of the word *Felis* implies that the household cat belongs to the genus *Felis* which also includes the European and Scottish Wild Cats; the African Bush Cat; the Asian Wild Cat, and others. All cats have many things in common including retractile claws and the genus *Felis* is included in the cat family *Felidae* which comprises in turn all typical cats including the lion, the Puma and others. The cat family *Felidae* is, in turn, included in an "order" *Carnivora*, or flesh-eating mammal, which also includes dogs, bears, weasels and others. The animals which give birth to live young and then suckle them are classified *Mammalia*. This class is then grouped with the fishes, amphibians, birds and reptiles in the *phylum Vertebrata*, comprising all animals with backbones.

It might at first appear that the natural classification system is little more than a system of cataloguing but it is far more than this for the position of *Felis catus* in the system immediately provides a great deal of information about its characteristics. The fact that *Felis catus* is placed in the *phylum Vertebrata* shows that it has a backbone, the fact that it is further classified as a mammal shows that it is one of the vertebrates having reached the most complete development and adaption to life on land, the fact that it is in the order *Carnivora* shows that it is a flesh-eater and so on. In fact the natural classification of the household cat provides an indication of the steps it has taken throughout its evolution.

By fossil evidence it seems clear that life has existed on earth for at least 500,000,000 years. Earth itself is thought to have existed for at least 3,000,000,000 years. It is known that most of the major groups--the *phyla*--appeared during the Cambrian period of evolution and this makes it practically certain that many simpler animals must have lived in pre-Cambrian times, although leaving little trace. This lack of pre-Cambrian evidence is probably due to the fact that animals of the first *phyla* to evolve had bodies lacking in the hard parts that would fossilise.

The *phylum Vertebrata* emerged just after the Cambrian period and it seems likely that the lower *phyla*, represented today by amoeba, sponges, jelly-fishes, corals and so on, arose before the more advanced ones. Within each *phyla* it is the rule that the less specialised groups appear before those that are more specialised and it seems logical to assume that each new *phyla* may have arisen as a development from one branch of an earlier one.

As well as this generalised picture of the evolutionary processes made clear through fossils, other evidence has been obtained where fossilised remains provide a reasonably complete record of changes during the evolution of one group of animals from another.

The study of embryology has provided further evidence of the evolutionary processes leading to the present day household cat. In fact every member of the *phylum Vertebrata* begins life as a single cell which, by division, produces a multicellular embryo. These cells arrange themselves by folding and other means to give rise to a series of stages which resemble the organisation of young stages in lower animals. Obviously many features of the developmental stages are adaptations to the particular conditions of the embryo's environment. Clearly the embryological history of the cat, which is passed through in a part of the oviduct of the female parent, is different from that of the frog which is passed through in water. By discounting the differences that are obviously adaptional it can be seen that the main features are similar in both. In fact the embryos of all members of the *phylum Vertebrata* are similar to each other in the presence of a number of structures which have no obvious function other than in the fishes. Embryo birds have gill slits which certainly do not act as respiratory organs. Embryo cats have gill pouches. Even though these structures may not appear necessary it seems likely that in some way they contribute to the development of the adult bird or cat. It is known that in the cat the first gill pouch becomes the tube connecting the middle ear to the throat and that its outer blind end becomes the ear drum.

Other evidence for evolution is provided by the geographical distribution of different kinds of animals on earth. Not only have certain areas their own characteristic creatures but similar areas in respect of temperature, latitude, elevation and so on, but in other parts of the world do not always have the same animal forms. Sometimes representatives of particular animal groups occur at widely separated places yet not in the areas between them. Animals occurring in such a way are usually members of primitive groups known to have had a much wider distribution geographically in earlier times.

Populations of primitive animals undertook migrations and these resulted in a slow steady spread from their place of origin. During these slow migrations evolutionary changes occurred making the animals better adapted to their changing environment and therefore the present day distribution of any group of animals depends firstly upon its centre of origin, secondly upon the extent to which migration was hindered by geographical barriers and thirdly upon its ability to survive in the regions it reached. Limits to migra-

tion are set by natural barriers including mountain ranges, seas and differences in temperature and geographical barriers such as these have changed throughout the earth's history. The surface of the earth has been altered by upheaval and subsidence so that land masses now completely separated by water were once linked together.

Probably the most important evidence on evolution is that provided by comparative physiology and genetics. In animals bred under controlled conditions it has been demonstrated that occasionally a character is altered and inherited in the altered form. This is known as mutation. Some mutations have been found to show their effects only when the gene concerned is inherited from both parents while others show their effect when only one gene is present. Selection does not begin to operate in the former case until like is mated to like but, in the latter case, the mutation immediately comes under the action of selection and, if favourable, will tend to persist at the expense of the normal type. In most instances selection acts upon the effects produced by a complete gene complex or genotype and very rarely on effects produced by a single gene. However, a single gene may influence more than one character so that several apparently quite unrelated characteristics may appear as the result. Certain effects produced may benefit an animal while others may be harmful. In this way many of the so-called non-adaptive characters may well have arisen during evolution. **Mathematical** evidence has shown that small mutations allied with the natural processes of selection are sufficient to explain evolution in the 500,000,000 years since life has been known to exist.

The history of the earth is divided by geologists into eras and periods but perhaps the divisions of time more easily understood in relation to the evolution of the cat are the following: the Dawn of Life; the Age of Fishes; the Age of Reptiles; the Age of Amphibians and finally the present age, the Age of Mammals. The ages are named after the creatures dominating the earth at that time. Although in each age there are other creatures not necessarily in a minority but certainly less powerful and waiting for their opportunity to seize the supreme position.

The household cat has developed from the ear-

ly vertebrates of the Age of Fishes which evolved a basic structural plan of an elastic axial rod flanked by segmented muscles to make a particular mode of swimming possible. This rod proved effective in other ways and in later members of the group it became replaced by a more developed vertebral column. The members of the group with vertebral columns are, of course, the vertebrates. During the Age of Fishes, the early creatures with vertebrate characteristics increased and diversified into many branches from which later evolved the amphibians which creatures were only partly tied to the water. They had limbs instead of fins and, in the adult form, had lungs instead of gills. However, they still returned to the water to breed and the early stages of the young were spent in the water.

Towards the end of the Age of Amphibians a group of reptiles evolved. They conquered every habitat and ruled the earth throughout the Age of Reptiles. They were completely adapted to life on dry land, both in the embryo form and as adults. Instead of gills they had lungs and their skins were dry and scaly. They were warm-blooded and had a special mechanism for the regulation of body temperature.

These early reptiles were the first creatures to reproduce on dry land. They laid eggs, as had their fish and amphibian ancestors, but the eggs were complicated structures containing the embryo in a large sac to give protection against injury, thus acting as a substitute for the amphibians natural pond. This was the period in history that saw the formation of the Andes and the Rocky Mountains and once the primitive creatures of the time had been freed from the aquatic existence of their ancestors they multiplied and developed into the countless types of reptile that flourished throughout the age.

It may be thought that mammals would have evolved from the later reptiles but the facts are that the stem of the reptilian order from which they sprang was one of the first to be differentiated from the primitives and the first mammals appeared about the same time as the first dinosaurs but remained inconspicuous in order to survive.

In mammalian evolution the first stage was that of the pelycosaurs---creatures more slimly

built than some other reptiles but still with the limbs sprawled out at the sides of the body. Supposed descendants of the pelycosaurs were the therapsids and in this group a man'nal-like reptile known as the **cynognathus** is important in feline evolution. It was rather lightly built with a jaw approaching that of the later **mammals** and is classed as a reptile but is truly neither reptile nor **mammal**. It is thought to have looked like a cross between a lizard and a dog. These early **mammal**-like forms were **common** during the early part of the **Age of Reptiles** but were soon crowded out by the more specialised archosaurs and disappeared at the end of the first period living on only through their mammalian descendants.

It is believed that the early mammals were nocturnal creatures living mostly in the trees and it has been suggested by a number of authorities that the **Age of Reptiles** acted as a period of training during which mammalian wits were sharpened and mammalian characteristics perfected. By the time the great reptiles died out, the higher **mammals** were **more** than ready to take the supreme position on earth and the **Age of Mammals** had begun.

The **Age of Mammals**, or Cenozoic era, is divided by geologists into two periods. In the latter phase of the first period, there has been found evidence of a gradual cooling of the earth culminating in the Pleistocene Ice Age. Mammals were developing into two great groups---the marsupial or pouch-bearing animals and the placentals. Of these two groups the marsupials are more primitive and were more abundant. Other than in size, the present day opossum is thought to be very similar to the marsupial animals of this time. At the beginning of the **Age of Mammals** the opossums were spread widely over the earth but other than in the south African and Australian regions they were supplanted by the placental animals which accompanied them.

The placental mammals had evolved an efficient placenta at a very early time by a gradual process which resulted in one of the membranes surrounding the developing egg coming into contact with the walls of the uterus in which it was contained. Thus food and oxygen could be carried through the connecting walls. In this way the embryos were able to reach a far higher stage of development than had been possible previously and this system of reproduction is thought to be one of the main reasons for the success of the placental **mammals**.

The first placentals are thought to have lived on a diet of worms and insects and few of the original members of the group have survived. However they are the ancestors of all the higher mammals now living---including cat and man. In many ways a diet of insects and worms can be considered a flesh diet and it only needed an increase in size for some of them to become capable of preying upon other members of the group which had become herbivorous. The typical shearing teeth of the carnivores were present in nearly all of these early species. At first the early carnivores were almost indistinguishable from their ancestral insectivores but, as the types developed and diversified, most of them had long bodies with short limbs. These archaic creodonts, as they were known, were eventually replaced by the more modern flesh eaters---ancestors of the dogs, cats, bears and so on.

Among the creodonts there was only one group (**miacids**) with a good brain and it is from this

group that all the later flesh-eaters have evolved. In comparison with present day carnivores **Miacids** was not well endowed either physically or mentally and it lived in the tree tops of the tropical forests of its time. Its nearest contemporary relative is the civet inhabiting Africa, parts of Europe and the East. From stock such as this there evolved the fissipedes (**split feet**) and typical of these was the little **Cynodictis**, otherwise known as the dog weasel. The name "split feet" is used to distinguish it and its relatives from the web-footed sea carnivores and in appearance the animal seems to have been very similar to a "foreign type" cat. It was not particularly specialised in any direction and although classed as a dog it is likely to have been close to the starting point of all the later carnivore species including the cat. It is thought to have had a long slim body, long limbs, slender tapering tail, and a long head with pricked ears.

During the Oligocene period in which **W-dictis** lived, it is known the land living carnivores began to divide into two main groups and while cats and their relatives went into the group including civets, hyenas and so on, dogs became part of the group including raccoons, bears and weasels. The history of vertebrate evolution covers 400 million years but it is less than half a million years since man's ancestors began to develop towards the races of today. By the end of the Oligocene period in evolution the cat had reached a stage far nearer its form of **Felis catus** than man had reached towards his **Homo sapiens**.

The word "cat" describes all members of the family **Felidae** and all cats, whether domesticated or wild, are particularly well adapted to a predatory mode of life. In fact they are the most carnivorous of all the carnivores. The cats important in the evolution of the domestic cat **Felis catus** are the African Bush Cat, **Felis lybica**, the Asian Wild Cat, **Felis chaus**, and the European or Scottish Wild Cat **Felis sylvestris**.

The African Bush Cat is also known as the Caffer Cat and is similar to the European Wild Cat in coat pattern although the stripes are more distinct in the latter. Both can justifiably be described as Mackerel Tabby (or striped tabby). In other ways they differ considerably and while the African Bush cat is lightly built with a long slender tail the European Wild Cat is heavier, with a broader head and a short blunt-ended tail. The Asian Wild Cat, also known as the Jungle Cat, is similar to the domestic Abyssinian tabby in its coat.

(In her next chapter of "Purring Creature", Miss Turner touches upon pre-historic cats in Egypt and Europe, the cat in witchcraft, and developments up to the time of the first formal cat show.)

Pet Pride Cat Seminar

The first Pet Pride Cat Seminar will be held Sunday, March 25, in Los Angeles at Hotel Bel Air.

Will Thompson will emcee a program featuring well-known speakers---veterinarians, pet food representatives, and Pet Pride members and directors.

There will be panel discussions on many interesting aspects of cat fancying including shelter clinics, legislation, breed points, nutrition, grooming, health, fund raising, cat publications, etc.

The \$10 reservation fee includes lunch and may be sent to Pet Pride, 15113 Sunset Blvd., Pacific Palisades, Ca. 90272