

EVOLUTION

The Dog's Family Tree

Dogs, Wolves, Foxes, Bears and Raccoons all Descended From Little Miacis; Cats Come in as Second Cousins

By **FRANK THONE**

WHFN TOWSER teases Tabby and drives her up a tree, or mayhap instead goes whimpering back to kennel with clawmarks on his nose, we have merely been witness to a little family tiff. For dogs and cats are second cousins.

And when a British squire rides to hounds after the fox, and when his longer-legged American or Canadian cousin follows taller hounds after wolf or coyote on the plains of the West, they are exploiting for their own benefit a more intense feud between even nearer animal kinfolk. For dogs are zoologically first cousins to foxes and bears and raccoons, and practically blood-brothers to wolves.

In a general way we have known this for a long time, but the details of the dog's family tree have been worked out only recently. The late Prof. W. D. Mathew of the University of California, who died only a short time after his study was completed, drew up a family tree of the canine clan, in which he placed not only all the living relatives of the dog but also the cousins who have departed this life during the past half-dozen geological generations, leaving no descendants.

Very curious gentry they were, too, some of these cousins who failed to be ancestors. There was one dog, for example, that was bigger than any living bear. Another one had a forehead so bulging and prominent that its skull earned for the species the nickname of "Highbrow Dog."

There are some members of the dog tribe today that seem to be surviving cousins of a long-gone time. They are isolated species, quite unlike their other cousins now living, showing no evidence of having evolved much during the past ten million years or so, and no promise of doing any more evolving. They are canine Tories, resisting all change, hanging on to things as they are, content with surviving.

Two such groups figure in Prof. Mathew's genealogical chart. One of them is the dhole, the wild dog of the Indian

hills, whose fierce packs are said to hunt even the tiger himself. The other is an obscure genus known as the long-eared wolf of South Africa, a creature very seldom seen even as a mounted museum specimen.

Our own familiar raccoon seems to belong to another of these conservative animal houses; he is quite primitive in many of his characteristics, and seems to tie back to an animal that was neither raccoon nor dog but a bit of both, some thirty-five or forty million years ago.

Neither Dog Nor Cat

Back of that, however, there is a still older animal ancestry, a group of flesh-eaters that were neither dog nor cat nor bear nor fox nor raccoon. Scientists studying their bones, or anybody looking at the restorations that artists have sketched over those fossil frameworks, can see things about them that suggest any or all of those animals. They are evolutionary grab-bags, out of which natural selection will pull assortments of anatomical and physiological features, assembling them in patterns that best fit the environment of the moment, and starting them on their careers as ancestors or as lines of descent that run into blind alleys and die out.

Away back at the beginning of the age of mammals, estimated at about sixty million years ago, there was a whole block of these creatures of mixed evolutionary potentialities, known collectively as the Creodonts. Some of the members of this heterogeneous tribe looked something like hyenas, others like compromises between wolves and wildcats. But all of them except one line got into evolutionary culs-de-sac, and they have no modern descendants.

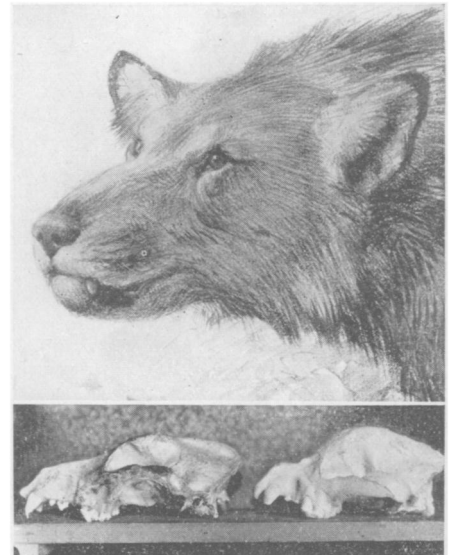
The one excepted line, represented by a primitive little animal about the size of a foxterrier and known as *Miacis*, seems to have been the fundamental stock from which all present-day land-dwelling flesh-eaters descended.

Little enough is known of *Miacis*. He lived so long ago, he was so small that his bones had less chance of being fossilized than those of bigger creatures, and perhaps there weren't very

many of him anyway. However that may be, there isn't a complete *Miacis* skeleton in any museum today; nothing but a few skulls and a larger number of other miscellaneous bones. So we can't make a very certain picture of what he looked like. But the skulls do seem to be a converging-place for the characteristics that later developed in such diverse lines of evolution as dogs, weasels, cats and raccoons.

Beginning then with *Miacis*, Prof. Mathew traced the descent of the dog. In the second of the five geological periods that together make up the Age of Mammals, *Miacis* had two lines of descent that are of significance so far as dogs and their relatives are concerned. One of these, known as *Dapboenus*, was the ancestor of the bears and of those strange monsters the "bear-dogs" that at last came to be bigger than any bear. These latter must have been the most formidable fighting and killing animals that ever lived.

The other line is represented by a small animal, intermediate between dog and fox in general appearance and about the size of a fox, which has been named *Cynodictis*. It differed from both dog and fox, however, in having a most extraordinarily long tail, like a cat. Its long, flexible neck, too, was rather sug-



"Highbrow Dog"

But *Borophagus*, restored here by Charles R. Knight, was only a noble bluff: his bulging forehead was mostly bone, and his brain was small. Lower picture: skull of *Borophagus* (right) compared with skull of a modern wolf.

gestive of the cats; though by this time the descent was quite definitely committed in the dog-direction.

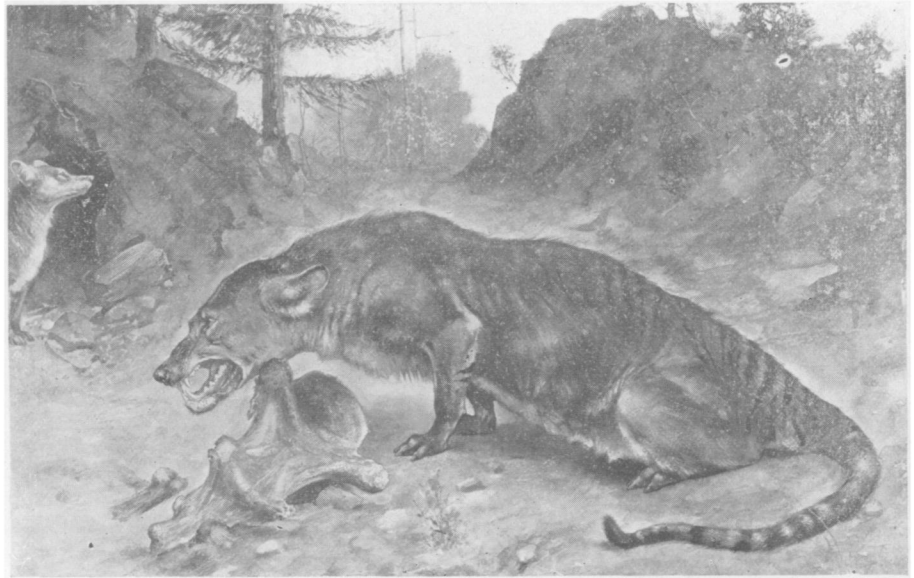
With the coming of the next, or middle, geological stage in the Age of Mammals, according to Prof. Mathew, there were seven distinct lines of animal descent in the dog tribe, as many as there are today. One of these was the first of the giant "bear-dogs"; another the first of all bears, though still sufficiently dog-like to be called *Hemiyon*, which is Greek for "half-dog." From here on the bears came down in a pretty straight line. One of the middle stages had such a peculiar skull that it has been called *Hyaenarctos*, or "hyena-bear." A later type of bear, that lived during cave-man times, was exceedingly short-nosed, and must have presented a comically stupid appearance to our skin-clad forefathers.

Dog With Cat's Teeth

But the main line of dog descent kept to moderate size—about the proportions of a coyote or a little smaller—and to a structure and general appearance that was becoming decidedly wolf-like. From this ancestor Prof. Mathew drew five lines of descent. One, the direct line, leads to the genuine wolves, which were fully developed by the time the latest Ice Age came, two or three hundred thousand years ago. One leads to the foxes, and one to a peculiar animal in South Africa, known as the long-eared wolf, though it is no bigger than a fox and is not a true wolf.

Two of the lines of descent ended in types long since extinct. One was an animal about as big as wolf, known as *Aleurodon*, which means "cat-tooth," because some of its teeth were more cat-like than dog-like. In other respects, however, it was an unquestionable dog.

The second of these lines of descent included a most curious thick-headed dog, known as *Borophagus*, which translates as "gluttonous eater"—probably a safe enough assumption to make about so gross-bodied an animal. The most striking feature about the *Borophagus* skull is the abrupt height of the forehead, as compared with that of the highly intelligent modern police dog, or the wily wolf of the timber. This gave the animal its nickname of "the High-brow Dog"; and Prof. Mathew said that while his field party was digging for fossil skulls of this species the irreverent bone-searchers often referred to it as "Professor *Borophagus*." But alas for appearances! Behind that bulg-



Courtesy American Museum of National History.

A CREODONT: NEITHER CAT NOR DOG

But possessing some of the characters that later developed in several different lines of carnivores. It was a primitive Creodont, Miacis, that was the common ancestor of all modern dogs, foxes, bears, etc. This restoration painting is by Charles R. Knight.

ing brow was only bone: its brain cavity was considerably smaller than that of a modern dog of the same size.

It was a wolf of the Ice Age that begat sons which are our wolves of today, and also our dogs, trustiest and most intelligent friends that man has in the animal world. It is easy to see the wolf in an Alsatian shepherd or even in a heavy-boned, wrinkle-faced St. Bernard; a little more difficult, perhaps, in such effeminate degeneracies as Pekes and Poms and Mexican hairless pups.

Offspring of the Wolf

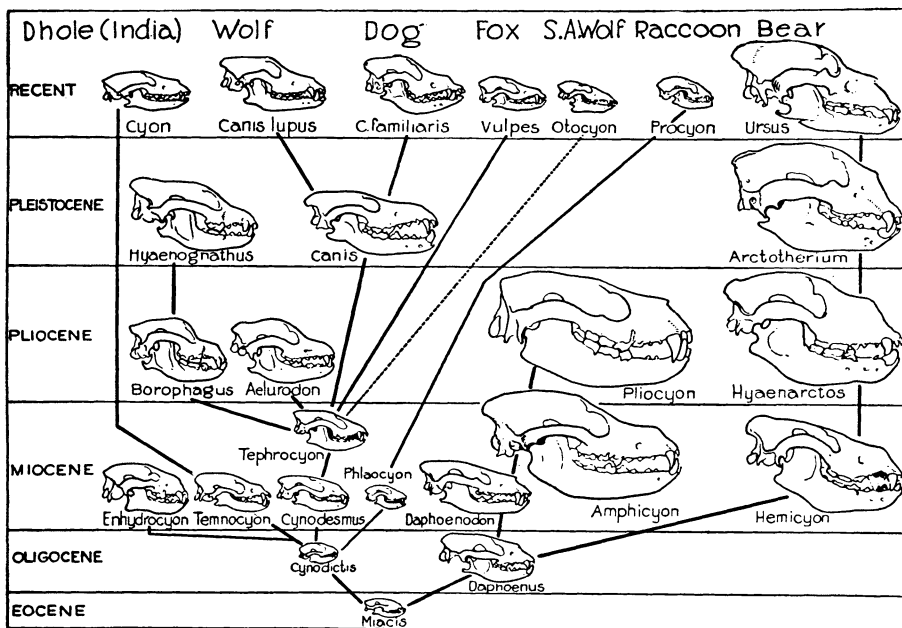
Yet even these are wolves' offspring; and the spark of spunk that sometimes sets a lapdog to yapping at a policeman is a not-quite-extinguished souvenir of the days a hundred thousand years ago when the first half-tamed wolfdog stood in the entrance of a cave which he shared with a man almost as shaggy as himself, and barked defiance at a prowling enemy.

With the theories held by some scientists, that the modern domestic dog is a mixed-blood animal, part wolf, part jackal, perhaps part fox, Prof. Mathew did not agree. He could not find any evidence in the fossil record of anything but wolf in the ancestry of the dog. In this contention he had the support of Dr. J. W. Gidley and Gerritt Miller of the U. S. National Museum. Most dog lovers will hope he was right

for a wolf is certainly a more worthy beast of prey than a fox or a jackal.

The line of descent that led from little *Miacis* of half a hundred million years or more ago down to the modern wolves and dogs has been a direct and definite one, as though the animal were being guided to a given goal, with the penalty of extinction for turning aside visited upon its errant brothers who perished by the way. The originally slim, lithe, rather weasel-like body has become deeper, shorter and more compact. The legs, especially the foreleg and ankle portions, have become longer, trimmer, better adapted for long running. The foot raises itself ever more definitely on the toes, and the claws, once more or less retractile like a cat's, remain permanently out to give firmer purchase on the earth in running. The once long tail is now much shortened. The jaws have become longer and the eyeteeth larger and sharper, fitting the animal for a running, slashing attack.

The dog's second cousin, the cat, has developed in a wholly contrary direction. Its body remains more slender and lithe, permitting stalking approach upon the prey. The legs, though powerful, are shorter. The paws, which turn inward more easily than those of the dog, are armed with curved hooks for claws. The shorter jaw is a holding weapon, not a slashing one. The whole animal mechanism is set for a stealthy approach



FAMILY TREE OF THE DOG AND HIS KIN

As drawn up by the late Prof. W. D. Mathew of the University of California. Note the gigantic size of some of the extinct "bear dogs."

under cover and a sudden leap at the shoulders and neck. If the first pounce fails, the prey will probably escape; the cat cannot pursue its quarry for miles as a pack of wolves or hunting dogs will do.

Dogs' Social Development

The only cat-like animal that hunts like a dog, the cheetah of southeastern Asia, is built more or less like a dog: long-legged, armed with claws that cannot be withdrawn, rather longer-jawed than most cats.

The secret of these diverging modes of development in dogs and cats, Prof. Mathew indicated, lies in the kind of country each line chose for its habitation. In the forest, which is the natural home of cats, there is cover behind which the hunter can lurk, and there are natural paths down which the intended prey may be expected to come. But dogs developed in open lands, on the prairies and plains, where hiding is not very good and where the herbivorous beasts are longer-legged and fleet. One must therefore be able to give chase and follow, if necessary, for miles.

Prof. Mathew pointed out that the environment probably influenced not only the dog's physical frame but his mental makeup as well. Dogs are social; they hunt in packs. Cats are solitary as a rule. Why?

Pack-hunting gives much better chance of success where pursuit has to go on for miles and hours. The pack

can spread out, preventing the quarry from doubling. When the prey is at last overtaken, the hunters can take turns leaping and slashing; everything need not be staked on one pounce of one animal. In the open there is greater strength in numbers.

But in the jungle, where the cats hunt, there need be no long pursuit, no repeated leap and slash. One pounce suffices to bring down the prey. And if one has no hunting companions one need not share the meat. So cats can be solitary.

This has influenced the respective degrees of domestication to which it has been possible to bring cats and dogs. Cats do not form permanent associations with their own kind; they make no friends, have no loyalties. Why then bother to find friends among an alien species, like man—unless you can get something out of him? So the cat continues to walk by herself.

But the dog, accustomed by long ages of pack-hunting and friendly living with other creatures of his own species, is naturally social. He has some notions of the advantages of mutual effort toward a common end. He knows something about loyalty toward a leader, toward a tried mate. It is therefore not so hard for him to take a two-legged creature into a hunting partnership, or to elect him to the high privilege of loyal friendship.

Science News Letter, July 11, 1931

ENGINEERING

Electric Heating Keeps Chickens Warm

BOILING water with electricity to keep chickens warm is the unusual job that has been undertaken by a combination of mechanical and electrical engineering at a big poultry farm near Edinburgh.

Chickens rather than humans, according to the English technical weekly, *Engineering*, are getting the benefit of the latest advances in both fields of engineering. Not only are nearly 100 per cent. efficient electric boilers being employed, but use is made of a seldom-used device, the steam accumulator. The accumulator, installed for safety's sake, stores up steam and prevents a failure in supply that might cause two million chickens to die.

Warm air, changed twenty times every hour, is carried to the brooder rooms and circulated over the radiators by means of fans. All controls, including those of the boilers and accumulator, are automatic. Except for the supervision of an electrician in the daytime, the apparatus receives no attention.

Science News Letter, July 11, 1931

ICHTHYOLOGY

Unlike Relatives, Trout Prefer to Stay Home

UNLIKE those fish that are caught traveling many hundreds of miles from home, as evidenced by tags placed on them in the home waters, Wisconsin trout seem to prefer the comforts of home to travel through the seven seas.

At least this was indicated by recent experiments when trout caught, tagged, and returned to Wisconsin streams were recaptured from one to several weeks later within a quarter of a mile of the spot of original capture. Many of them apparently had not moved at all from their favored bit of water.

Wisconsin, which already has many fish spawning sanctuaries, recently established 96 more for trout, bass, pike, and pickerel.

Science News Letter, July 11, 1931

Nearly 200 schemes for calendar reform have been presented to the League of Nations.

The use of soybeans goes back to the beginning of China's agricultural age under Emperor Shen Nung.