

Animals' Tails Are Tools of Many Uses

Zoology

Weapon, Propeller, Extra Hand, or What Have You

By Frank Thone

"Sir Brian had a battleaxe with great big knobs on;
He went among the villagers and blipped them on the head.
On Wednesday and on Saturday, but mostly on the latter day,
He called at all the cottages, and this is what he said:
'I am Sir Brian (ting-ling)
'I am Sir Brian (rat-tat)
'I am Sir Brian, as bold as a lion—
'Take that!—and that!—and that!'"

THUS A. A. Milne, in one of his unforgettable children's poems that have given endless delight to grown-ups. But the Sir Brian he celebrates, and all of his medieval mace-swinging compeers, were not in the least original. Their invention of a war-club "with great big knobs on" was anticipated by dumb animals in armor that roamed America from Texas and Oklahoma far southward to Patagonia, a quarter of a million years ago.

They were probably very dumb animals indeed, for they were related to the modern armadillos, and armadillos have never been noted for their mental brilliancy. They don't know enough to come in out of the rain. They don't need to; however, for it seldom rains in armadillo country. When they are pursued, they escape by burrowing into the ground. If a persecutor overtakes one it curls up into a ball, tucks its head between its feet, laps its tail over the joint, and waits for its enemy to tire of trying to break through its impervious shell of armor and go away.

These ancient armadillos, known collectively as glyptodonts, pursued much the same defensive tactics. They squatted down instead of rolling into a ball, pulled their helmeted heads back even with the porthole through which their necks protruded, and waited for their foe—saber-tooth tiger, perhaps, or cave bear—to attack. One of these glyptodonts must have been a tempting mound of meat to set before a hungry Pliocene carnivore, for a big specimen measured as much as fifteen feet from nose to tail, and its domed shell stood five feet or more high. Their dental structure shows that they were plant-eaters, hence that their meat must have been toothsome.

But woe to the bear or saber-tooth



Archaeopteryx, earth's earliest bird, had a long tail that was probably a valuable gliding plane as well as a rudder.

who might lust after such a walking fleshpot! These giants were not content to be meek though tough-shelled footballs, like their modern degenerate successors. A glyptodont couldn't use his head much, but he surely could use his tail.

There it projected, five or six feet astern, a massive post of a tail, armored like the rest of the beast. The basal third was flexible, its armor in sliding rings. Then there came a long, rigid, tubular portion, ending in a great bristling spiky warclub—a mace, "with great big knobs on." Any meat-hungry animal that came within range of its sweep would not get off with being merely "blipped on the head". The blow of the spiked tail of Blippo the Glyp must have come with all the force of an elephant's kick—if you can imagine an elephant's hind foot armed with a cluster of pointed tusk-tips. It is hardly imaginable that a beast of prey would return to the attack after receiving one such side-swipe. If it escaped with its life it must have been glad enough to

crawl off and nurse its broken legs and crushed ribs.

To zoologists this weird beast that made war with its tail is known as *Daedycurus clavicaudatus*. The first word is Greek, and means "skilled-tail"; the second is Latin for "club-tail". Which really sums up the situation very neatly. There were other glyptodonts that did not have the refinement of spiked mace-heads at the ends of their tails, but they could use their knob-cruled, hard-shelled caudices for weapons nevertheless, and brush off saber-tooth tigers as easily as a cow now brushes off flies.

Vastly more remote in time than the glyptodonts, a hundred million years ago or more, there were vegetarian dinosaurs that could also wage defensive warfare by wagging their tails. There were the stegosaurus, monsters as big as a good-sized garage, ornamented with a double row of bony plates the size of sidewalk slabs, set up edgewise.

Those slabs were their defensive armor. Their bodies were not encased in complete bony turrets after the fashion of the later-coming glyptodonts, but the standing slabs prevented the tyrannosaurs and other carnivorous gentry of their day from biting down into their spinal columns.

If a carnivorous dinosaur attacked a stegosaurus, the latter probably pivoted its forequarters away from the onset and brought its massive muscular tail to bear. Instead of a spiky club, this tail was even more viciously armed with two pairs of two-foot horns or spikes—veritable natural sabers, pointing outward and upward. A fair blow with these weapons against the meat-basket of a rearing tyrannosaur must certainly have punctured him beyond all hope of repairs.

This use of the tail as a weapon is widespread in the animal world. It is only one of the many utilities of an organ which proud man, who hasn't any, is apt to rate below its true value to animals fortunate enough to have tails, or even to misprize as comic. A tail is anything but comic. It is one of the most versatile of all instruments. Mounted on the terminal facilities of many



Kinkajou climbs his own tail, hand over hand, like a sailor going up a rope.

different kinds of animals, both those now living and those that have lived during past geologic times, it has served most excellently as defensive weapon, protective camouflage, propeller, extra hand, third hind leg, and in a host of other ways. In the animal world it has been in a thousand instances literally a case of "Tails, you win!"

Even today there are animals that use their tails as effective weapons of defense, though we no longer have gigantic examples such as the glyptodonts and the stegosaurus. Just as well we don't, perhaps. But on a smaller scale, consider the porcupines. These interesting but unapproachable animals are found all over the world, from Canadian snows to African jungles. And whenever you find them, they will greet you in the same hostile fashion—by nervously flicking their tails.

Most porcupines have short, stubby tails, so that their "blipping" range is not great. But an animal craving the blood of a humped-up and bristling porky is very apt to sniff around the defenses and thereby bring its nose within this limited sweep. If it does, woe to dog, or coyote, or puma! For the stiff, needle-pointed spines on this caudal weapon come loose very easily, and stick fast in whatever they hit. They are armed with minute backward-pointing barbs that prevent them from coming out, and even cause

"With great big knobs": The spiked tail of *Daedicurus* was the prototype of the mediaeval war mace, and terrible in battle against saber-tooth tiger and cave bear.

them to work themselves into the flesh, causing severe pain and sometimes even death.

These easily-detachable tail-quills are probably the cause of the ancient myth that the porcupine can "shoot" its spines. Sometimes a few of them will be so loose that a flick will send them spinning through the air for several feet, and if they happen to hit end-on they will stick and begin to work themselves in. But this missile use of tail-quills is probably not intentional on the porcupine's part.

There is one species of porcupine in Africa that has developed its tail into a specialized weapon on somewhat the same plan as that followed by the spike-tailed glyptodont of old. There is a strong but unarmed portion sticking out aft for eight inches or some such matter, and on the end a thick brush of villainous stiff spines. It is hard to imagine even a leopard getting the better of this doughty defensive fighter.

The use of tails as weapons of offense is relatively limited, unless one would wish to classify the stings of bees and wasps as tails. If this be admitted, then the hunting wasps certainly owe their livings to their tails, for they provision their nests with spiders, caterpillars and other creeping things paralyzed by the thrust of these posterior daggers.

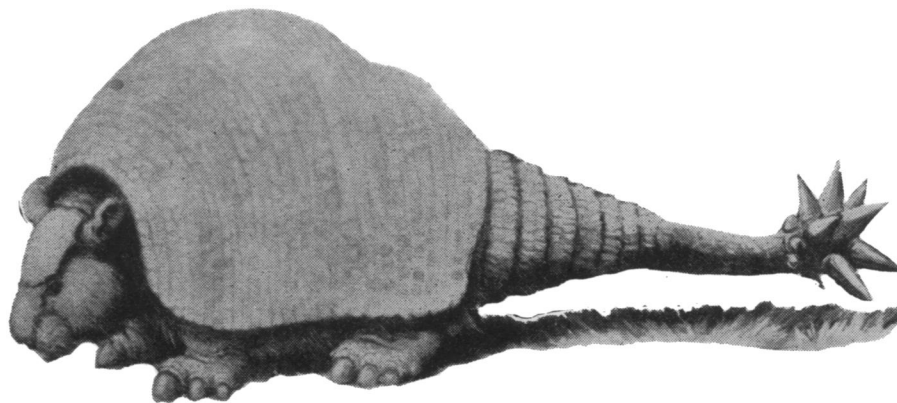
The military uses of the tail are not confined to its employment as an extra fist for dealing stout blows or as an arm wielding a handful of daggers. Tails are protective canopies of camouflage as well, as in the case of the squirrel. Its waving, flickering brush attracts attention away from the animal itself, and a

dive at this conspicuous object will net the ambitious fox or dog nothing more than a mouthful of hair—if he gets there soon enough to grab that much. Another hairy tail is a banner of defiance; to wit, the skunk's. Not even the fiercest and hungriest beast is going to attack when that flag is displayed.

But in general, making use of the tail as a weapon is a very special development, an evolutionary afterthought. The original use of the tail was as an organ of locomotion, and most of its many modifications have been improvements in that field—adaptations to special problems in the business of getting about in the world.

The first vertebrates undoubtedly developed in the water. Their bodies were tapered, spindle-shaped affairs—their most immediate descendants, the fishes, have kept the tradition well. But the earliest, pre-fish animals did not have the broad tails of fishes. They had a fringe of fin running down most of the back and turning over the end of the tail to continue for at least part of the way up the under-side. When the ancestor-vertebrate needed to move it just wriggled, and the longer and flatter its tail happened to be the more effective the wriggle was in pushing it forward through the water. Fishes still wriggle, but the sharp expansion of their tails gives a much more efficient thrust. The fish-tail is the original screw-propeller.

More strictly land-going vertebrates often make use of their tails as a sort of third hind leg. A kangaroo's long, powerful hind legs and thick, muscular tail form a literal living tripod, and make him the stablest of all biped animals. Although not at all closely related to the kangaroos, many rodents have adopted the same tripod trick, leaping on long hind (*Turn to page 110*)



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Animals' Tails—Continued

legs and resting upright with the aid of their tails. Such rodents are found in many parts of the world, and are almost always nicknamed "kangaroo rats," and "kangaroo mice".

Tails may be extra legs to ground-dwelling animals, but to animals that live in the trees, where a clinging hand is more important than a bracing foot, the same versatile organ becomes a third hand. Right where it is handiest too: well astern and behind the back, where the regular equipment of fingers and toes is most at a disadvantage. The classic examples of such five-handed climbers are of course the monkeys; the cool insouciance of a Rhesus or a spider-monkey in the zoo, as he swings indifferently by hand, foot, or tail, is one of the sure-fire attractions at any zoo.

But clinging tails are older by far than monkeys. The same primitive and very ancient mammalian family that boasts the kangaroo and his other weird relatives in Australasia has as its sole American representative the 'possum, beloved of Southern cooks. Nobody who has ever treed a 'possum needs to be told to what good effect this hard-tailed animal can grip a topmost branch and defy all efforts to dislodge him until the tree itself is chopped down.

The versatility of the tail in evolutionary development is strongly brought out again in the case of a South American tree-porcupine. All porcupines can climb trees, but this one lives almost altogether among the branches. And its tail, instead of being a dagger-loaded weapon, has become as prehensile as that of a monkey or an opossum.

Perhaps the extreme development of tails as hands is to be found in the kinkajou, an attractive little South American animal of the raccoon family. "Kinky's" tail is a rope as well as a hand. He swings by its curved and clinging tip until he tires of the exercise, and then he turns and climbs up his own tail like a sailor going up the rigging.

Swimmers in the thin ocean of air that is above our heads use their tails during every moment of flight. But whereas fishes use them as propellers, birds employ them only as rudders, and sometimes as brakes. A bird without a tail is one of the most luckless and ludicrous of animals. It has almost no control over its vertical steering, and

has considerable trouble as well in lateral turns.

Modern birds have very short tails, with the feathers set side by side like the ribs of a fan. But the earliest bird of which we have any fossil record had a real tail—a continuation of its spinal column nearly as long as its own body. Each joint was equipped with a pair of feathers, so that the spread of surface thus obtained must have been of considerable sustaining power in flight, not to mention its value as a strong and flexible rudder.

One of the most remarkable tails in the world is that possessed by the whip scorpion, known in the Southwest as the vinegarun or vinegaroon and in Florida as the grampus. This large and stout-bodied cousin of the true scorpions is dreaded as deadly throughout its wide range, but is absolutely harmless. The well-muscled and poison-tipped tail of the true scorpion is represented here by a thin, wirelike appendage, as long as its body or longer, but without the trace of a sting.

Just why this reduced trace of a scorpion tail should be carried to such a length it is hard to imagine. But the whip scorpion always has it, except when it has been broken off by accident—which does not seem to embarrass the vinegarun at all. It is carried clear of the ground, and constantly quivers and trembles, as though in great excitement. It may be that it serves as a sort of feeler, keeping the animal apprized of the approach of a possible enemy from the rear, and therefore of the need for more haste in moving along.

Whatever may be the case, here we have an undoubted example of an organ, useful in a related form, fallen into uselessness, and probably in the process of disappearing. Spiders, which are tailless, are evolutionary cousins of scorpions. It may be that in the whip scorpion we have a hint of how spiders lost their tails.

There are, on another branch of the zoological family tree, numerous species of tailed monkeys that make no use of their tails. Some of them have fairly long tails, others, like the ground-dwelling baboons, have short ones. It may be that here also we have a hint of the development of the tailless apes, man's nearest cousins on the animal side, from an original stock of happy and irresponsible swingers-by-the-tail.

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