

The Evolution of the Brain

Neurology

G. H. PARKER, in *The Mind and Its Growth—Yale Review, Spring, 1929*).

It has long been known that the central nervous organs of the backboned animals are primarily the spinal cord and the brain. In man the weight of the average brain is 1,360 grams, or almost exactly three pounds. The human spinal cord, which stretches downward through the back, weighs only some 26 grams, or about a fiftieth part of the brain. This disproportion is characteristic of the higher animals and especially of man. But in the frog the brain and spinal cord weigh one about as much as the other. In many fishes the weight of the brain is only a small fraction of that of the cord. In fact, in these animals the brain often seems little more than a slight modification of the front end of the cord. The series of animals from fish to man shows at once that of the two central organs, cord and brain, the former has changed very little, and in its conservatism it is in strong contrast with the brain, which not only in volume but also in complexity of structure has progressed prodigiously in the course of development.

Since in the evolutionary sequence receptors arose in advance of central organs, it is natural to expect that central organs would be moulded in their growth by the sense organs with

which they were associated, and such seems to be the case. Thus in the backboned animals the chief sense organs of the head are, beginning at the front, the nose, the eye, and the ear. Under these three pairs of organs has developed the brain, which in obedience to its sensory surroundings is divisible into an olfactory segment, an optic segment, and what may be called a positional segment, for the internal ears of vertebrates are, in general, more concerned with bodily equilibrium than with hearing.

In the lower forms the stem is practically all there is to the brain, but in higher vertebrates two additional organs appear. The first is the cerebellum, an upgrowth from the positional segment and a part that is concerned with the regulation and control of muscular activity. The second part includes the cerebral hemispheres, which are upgrowths from the olfactory segment and are at first probably entirely concerned with smell. They carry a very important covering of nervous material called the primitive mantle, or archipallium. In the higher vertebrates and particularly in the mammals this primitive mantle is crowded aside by the excessive growth of the so-called new mantle, or neopallium, which is a nervous surface upon which are reflected, as the sense of smell is reflected on the archipallium, all the senses of the body and from which

emanate the great nerve tracts for the voluntary movements. The old and new mantles thus together constitute an immense field for the assemblage of the chief sensory activities of the individual and also for the discharge of the impulses for volitional responses. This portion of the brain, particularly the part designated as the new mantle, shows a greater growth and differentiation among the mammals and especially the higher mammals than any other portion of the central organ. In man these parts are represented by that convoluted surface of immense complexity that occupies almost the whole of the outer aspect of the brain. . . .

Not only is this mantle of the brain a surface on which are projected the chief sensory and motor activities, but it is also the center for all the higher nervous functions. Here is our real organ of sensation; here the emotions have their processes that make up thinking, and from this center emanate our impulses to activity. This is the part of our body that is concerned with hard mental work, with philosophizing, with imagining, with the passions, and with all those higher activities that tend to make man different from the brute. If we are forced to seek a seat for the soul, this surely is it.

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Slaughter

Zoology

E. DOUGLAS BRANCH, in *The Hunting of the Buffalo* (Appleton):

At the first crack of his "pizen slinger" the hunter jumped to his feet and ran after the buffalo. They usually ran from fifty to a hundred feet at the first shot, and a speedy pursuer could go half that distance in the same time. "Then we would drop down and lam it into the first broad side we saw. Then we would have to jump up and run again. This time they would run not quite so far nor so fast, and after we repeated this game a few times we could hold our own with them."

There was some danger in this running, for the hunter had to pass by the first buffaloes he had shot, and sometimes the sight of the hunter brought them to their feet; but a second shot was usually all that they needed.

The vital spot of a buffalo—his heart—was to be reached by a shot fired from a point a little in his rear, the hunter aiming just behind the shoulder blade, and about two-thirds down from the top of the hump. A single shot well placed was quite enough to bring down the most formidable old bull. With the most accurate hunting rifle ever made—the Sharp's gun—and a large mark within easy range, a good hunter could make nearly every shot bring down a mortally wounded buffalo. But the old hunters believed "A buffalo will not die as long as he is angry."

If the herd was at rest, the hunter might make a "stand"—his most precious maneuver. The leader of the herd was the one to be shot down first. "The noise startles the buffaloes, they stare at the little cloud of white smoke and feel inclined to run,

but seeing their leader hesitate they wait for her. She, when struck, gives a violent start forward, but soon stops, and the blood begins to run from her nostrils in two crimson streams. In a couple of minutes her body sways unsteadily, she staggers, tries hard to keep her feet, but soon gives a lurch sideways and falls. Some of the other members of the herd come around her and stare and sniff in wide-eyed wonder, and one of the more wary starts to lead the herd away. But before she takes a dozen steps 'bang!' goes the hidden rifle again, and her leadership is ended forever. Her fall only increases the bewilderment of the survivors over a proceeding which to them is strange and unaccountable, because the danger is not visible.

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