

# A CIVIC BIOLOGY

Presented in Problems

BY

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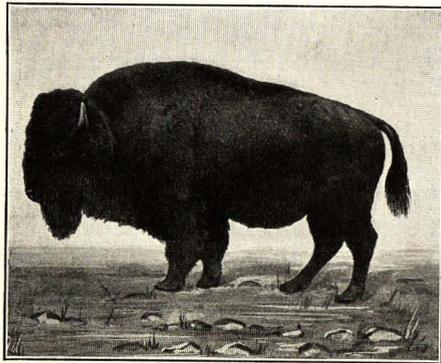
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HUNTER, CIVIC BIOLOGY.

W. P. 4

**Adaptations in Mammalia.** — Of the thirty-five hundred species, most inhabit continents; a few species are found on different islands, and some, as the whale, inhabit the ocean. They vary in size from the whale and the elephant to tiny shrew mice and moles. Adaptations to different habitat and methods of life abound; the seal and whale have the limbs modified into flippers, the sloth and squirrel have limbs peculiarly adapted to climbing, while the bats have the fore limbs modeled for flight.



The bison, an almost extinct mammal.

provided with hairy covering like other mammals. Such are the Australian spiny anteater and the duck mole.

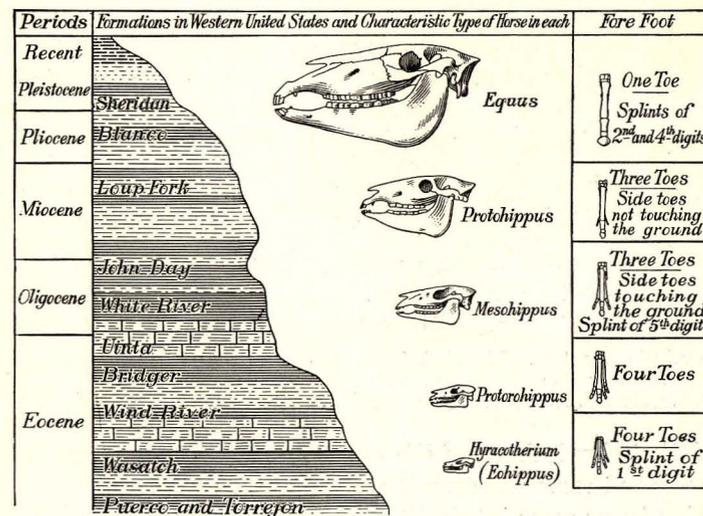
All other mammals bring forth their young developed to a form similar to their own. The kangaroo and opossum, however, are provided with a pouch on the under side of the body in which the very immature, blind, and helpless young are nourished until they are able to care for themselves. These pouched animals are called *marsupials*.

The other mammals may be briefly classified as follows:—

#### CLASSIFICATION OF HIGHER MAMMALS

- ORDER I. Edentata.** Toothless or with very simple teeth. Examples: anteater, sloth, armadillo.
- ORDER II. Rodentia.** Incisor teeth chisel-shaped, usually two above and two below. Examples: beaver, rat, porcupine, rabbit, squirrel.
- ORDER III. Cetacea.** Adapted to marine life. Examples: whale, porpoise.
- ORDER IV. Ungulata.** Hoofs, teeth adapted for grinding. Examples: (a) odd-toed, horse, rhinoceros, tapir; (b) even-toed, ox, pig, sheep, deer.
- ORDER V. Carnivora.** Long canine teeth, sharp and long claws. Examples: dog, cat, lion, bear, seal, and sea lion.
- ORDER VI. Insectivora.** Example: mole.
- ORDER VII. Chiroptera.** Fore limbs adapted to flight, teeth pointed. Example: bat.
- ORDER VIII. Primates.** Erect or nearly so, fore appendage provided with hand. Examples: monkey, ape, man.

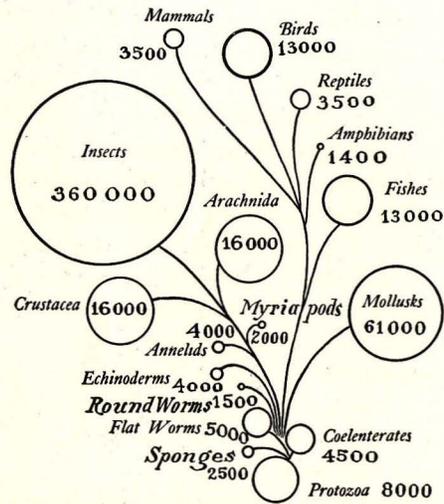
**Increasing Complexity of Structure and of Habits in Plants and Animals.** — In our study of biology so far we have attempted to get some notion of the various factors which act upon living things. We have seen how plants and animals interact upon each other. We have learned something about the various physiological processes of plants and animals, and have found them to be in many respects identical. We have found grades of complexity in plants from the one-celled plant, bacterium or pleurococcus, to the complicated flowering plants of considerable size and with many



The geological history of the horse. (After Mathews, in the American Museum of Natural History.) Ask your teacher to explain this diagram.

organs. So in animal life, from the Protozoa upward, there is constant change, and the change is toward greater complexity of structure and functions. An insect is a higher type of life than a protozoan, because its structure is more complex and it can perform its work with more ease and accuracy. A fish is a higher type of animal than the insect for these same reasons, and also for another. The fish has an internal skeleton which forms a pointed column of bones on the *dorsal* side (the back) of the animal. It is a vertebrate animal.

**The Doctrine of Evolution.** — We have now learned that animal forms may be arranged so as to begin with very simple one-celled forms and culminate with a group which contains man himself. This arrangement is called the *evolutionary series*. Evolution means



The evolutionary tree. Modified from Gal-  
loway. Copy this diagram in your note-  
book. Explain it as well as you can.

change, and these groups are believed by scientists to represent stages in complexity of development of life on the earth. Geology teaches that millions of years ago, life upon the earth was very simple, and that gradually more and more complex forms of life appeared, as the rocks formed latest in time show the most highly developed forms of animal life. The great English scientist, Charles Darwin, from this and other evidence, explained the theory of evolution. This is the belief that simple forms of life on the earth slowly and gradually gave rise to those more complex and that thus ultimately the most complex forms came into existence.

**The Number of Animal Species.** — Over 500,000 species of animals are known to exist to-day, as the following table shows.

|                         |         |                       |         |
|-------------------------|---------|-----------------------|---------|
| Protozoa . . . . .      | 8,000   | Arachnids . . . . .   | 16,000  |
| Sponges . . . . .       | 2,500   | Crustaceans . . . . . | 16,000  |
| Coelenterates . . . . . | 4,500   | Mollusks . . . . .    | 61,000  |
| Echinoderms . . . . .   | 4,000   | Fishes . . . . .      | 13,000  |
| Flatworms . . . . .     | 5,000   | Amphibians . . . . .  | 1,400   |
| Roundworms . . . . .    | 1,500   | Reptiles . . . . .    | 3,500   |
| Annelids . . . . .      | 4,000   | Birds . . . . .       | 13,000  |
| Insects . . . . .       | 360,000 | Mammals . . . . .     | 3,500   |
| Myriapods . . . . .     | 2,000   | Total . . . . .       | 518,900 |

**Man's Place in Nature.** — Although we know that man is separated mentally by a wide gap from all other animals, in our study of physiology we must ask where we are to place man. If we attempt to classify man, we see at once he must be placed with the vertebrate animals because of his possession of a vertebral column. Evidently, too, he is a mammal, because the young are nourished by milk secreted by the mother and because his body has at least a partial covering of hair. Anatomically we find that we must place man with the apelike mammals, because of these numerous points of structural likeness. The group of mammals which includes the monkeys, apes, and man we call the *primates*.

Although anatomically there is a greater difference between the lowest type of monkey and the highest type of ape than there is between the highest type of ape and the lowest savage, yet there is an immense mental gap between monkey and man.

**Instincts.** — Mammals are considered the highest of vertebrate animals, not only because of their complicated structure, but because their instincts are so well developed. Monkeys certainly seem to have many of the mental attributes of man.

Professor Thorndike of Columbia University sums up their habits of learning as follows: —

“In their method of learning, although monkeys do not reach the human stage of a rich life of ideas, yet they carry the animal method of learning, by the selection of impulses and association of them with different sense-impressions, to a point beyond that reached by any other of the lower animals. In this, too, they resemble man; for he differs from the lower animals not only in the possession of a new sort of intelligence, but also in the tremendous extension of that sort which he has in common with them. A fish learns slowly a few simple habits. Man learns quickly an infinitude of habits that may be highly complex. Dogs and cats learn more than the fish, while monkeys learn more than they. In the number of things he learns, the complex habits he can form, the variety of lines along which he can learn them, and in their permanence when once formed, the monkey justifies his inclusion with man in a separate mental genus.”

**Evolution of Man.** — Undoubtedly there once lived upon the earth races of men who were much lower in their mental organization than the present inhabitants. If we follow the early history

of man upon the earth, we find that at first he must have been little better than one of the lower animals. He was a nomad, wandering from place to place, feeding upon whatever living things he could kill with his hands. Gradually he must have learned to use weapons, and thus kill his prey, first using rough stone implements for this purpose. As man became more civilized, implements of bronze and of iron were used. About this time the subjugation and domestication of animals began to take place. Man then began to cultivate the fields, and to have a fixed place of abode other than a cave. The beginnings of civilization were long ago, but even to-day the earth is not entirely civilized.

**The Races of Man.** — At the present time there exist upon the earth five races or varieties of man, each very different from the other in instincts, social customs, and, to an extent, in structure. These are the Ethiopian or negro type, originating in Africa; the Malay or brown race, from the islands of the Pacific; the American Indian; the Mongolian or yellow race, including the natives of China, Japan, and the Eskimos; and finally, the highest type of all, the Caucasians, represented by the civilized white inhabitants of Europe and America.

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