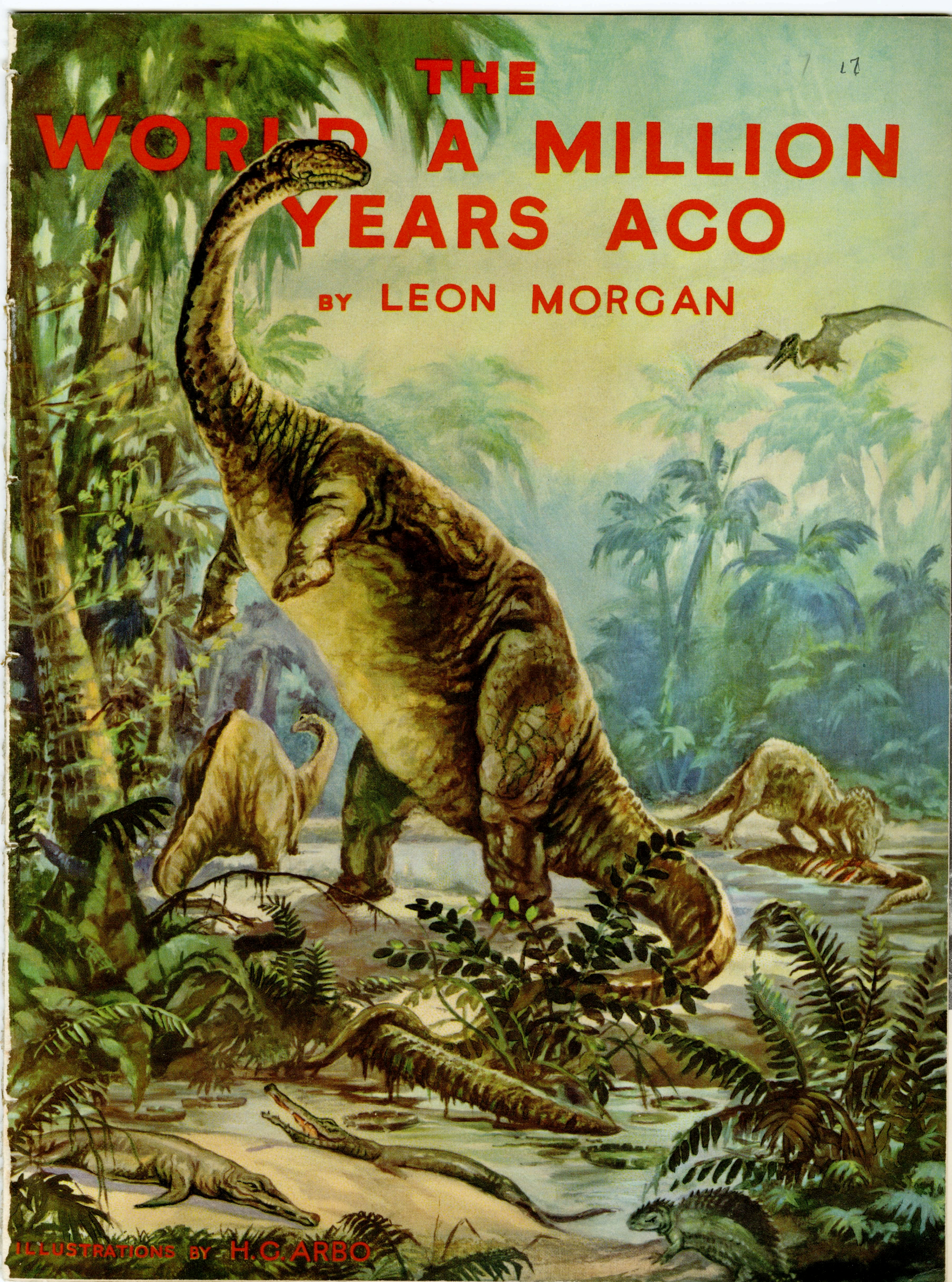


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THE WORLD A MILLION YEARS AGO

BY LEON MORGAN



ILLUSTRATIONS BY H. C. ARBO



THE WORLD A MILLION YEARS AGO

*Designed and built by Messmore & Damon, New York
Building by B.-W. Construction Company, Chicago*

"The World a Million Years Ago" is by no means a new idea. Many years ago when Messmore & Damon first started building animals that moved just as if they were alive, the idea of a great prehistoric zoo was born. So tremendous was the task, however, and so many the obstacles that had to be overcome, that in the press of business the idea was temporarily shelved. It was not forgotten, however, and often-times after the day's business was completed or over the luncheon table at noon, these two discussed the practicability of their dream. And then with the announcement of a great World's Fair to be held in Chicago, the dream was brought to life, a new show of tremendous possibilities, educational as well as amusing, scientifically accurate as well as

entertaining. And so "The World a Million Years Ago" grew into being and here Brontosaurus and other dinosaurs stalked once more through their jungle homes just as they did millions of years ago. The saber-tooth tiger and mammoth, the cave bear and sloth, the shovel jawed elephant and woolly rhinoceros, move and roar in a setting so natural that they actually seem to live again.

Nor has man been forgotten, for in four separate dioramas our earliest ancestors are represented, living, moving, talking, just as they did centuries upon centuries ago.

To Messmore & Damon then, whose idea this project is, this book is respectfully dedicated.

The Author.



IN the little village of Santa Maria del Tula in Southern Mexico is a cypress tree the circumference of which is one hundred twenty six feet. But besides its unusual size, this tree holds greater interest to scientists, for to the best of our knowledge the Del Tula Cypress Tree is the oldest living thing in the world today.

Back when Columbus first discovered the new world, this tree was a hoary monarch of the forest. Back when Greece was the center of the world's civilization — back when the Hebrews left Egypt — this tree was still a giant. It was several hundred years old when Cheops built the first pyramid. As a matter of fact, all human history since man began to make dependable records is spanned by the life of this single tree. And yet, old as this seems, it is hardly an episode compared with the countless millions of years that have expired since the world first began.

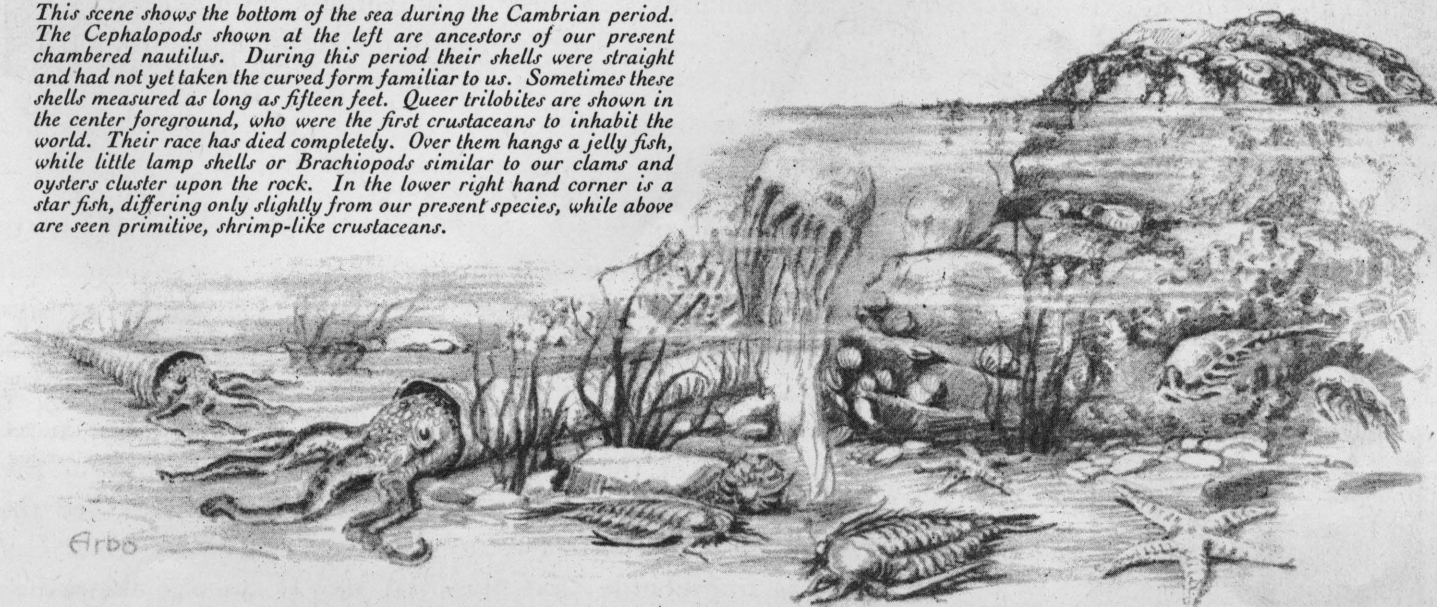
How old is the world? How did it begin? No one knows. But history has left its traces in the rocks, and the scientist who has spent his life in the study of these records can interpret them for us. His task is not an easy one. It is much as if we piled together many pieces from different jigsaw puzzles with a large percentage of the pieces missing, and then set about the task of reconstructing from this jumbled mass the original pictures. And so it is no wonder that much of the early history of the earth






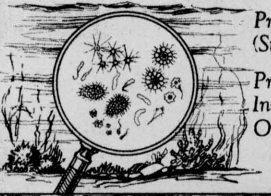

is lost — that our records are incomplete and that scientists occasionally make mistakes. The real wonder lies in the fact that we know as much about early earth history as we do, and that scientists have been able to read the record of the rocks as well as they have.

Space does not permit us to discuss the various theories of how the world began. Suffice it to say that it is probable that at one time the earth was a flaming ball of molten lava and rock over which hung a dense atmosphere of steam, for no water could rest on the torn, fiery surface. Save for the livid light from boiling volcanoes and seething rivers of live flowing lava, the earth was a place of darkness. No light could penetrate that dense outer atmosphere of smoke and steam.

Then, gradually, the earth cooled and contracted. The water descended in torrents of rain and for the first time the sun shone upon the new world — a desolate place enough with no grass or trees or any living thing—just great masses of burned, scorched rock and giant active volcanoes about whose feet lapped the warm, shallow seas. And in these seas life was born. At first, the simplest one-cell animals, so minute as to be invisible to the naked eye — then millions of years later primitive worms of whose soft body no trace remains and whose only record is their twisted tracks as they made their arduous way over the soft slime that paved their ocean home.

This scene shows the bottom of the sea during the Cambrian period. The Cephalopods shown at the left are ancestors of our present chambered nautilus. During this period their shells were straight and had not yet taken the curved form familiar to us. Sometimes these shells measured as long as fifteen feet. Queer trilobites are shown in the center foreground, who were the first crustaceans to inhabit the world. Their race has died completely. Over them hangs a jelly fish, while little lamp shells or Brachiopods similar to our clams and oysters cluster upon the rock. In the lower right hand corner is a star fish, differing only slightly from our present species, while above are seen primitive, shrimp-like crustaceans.



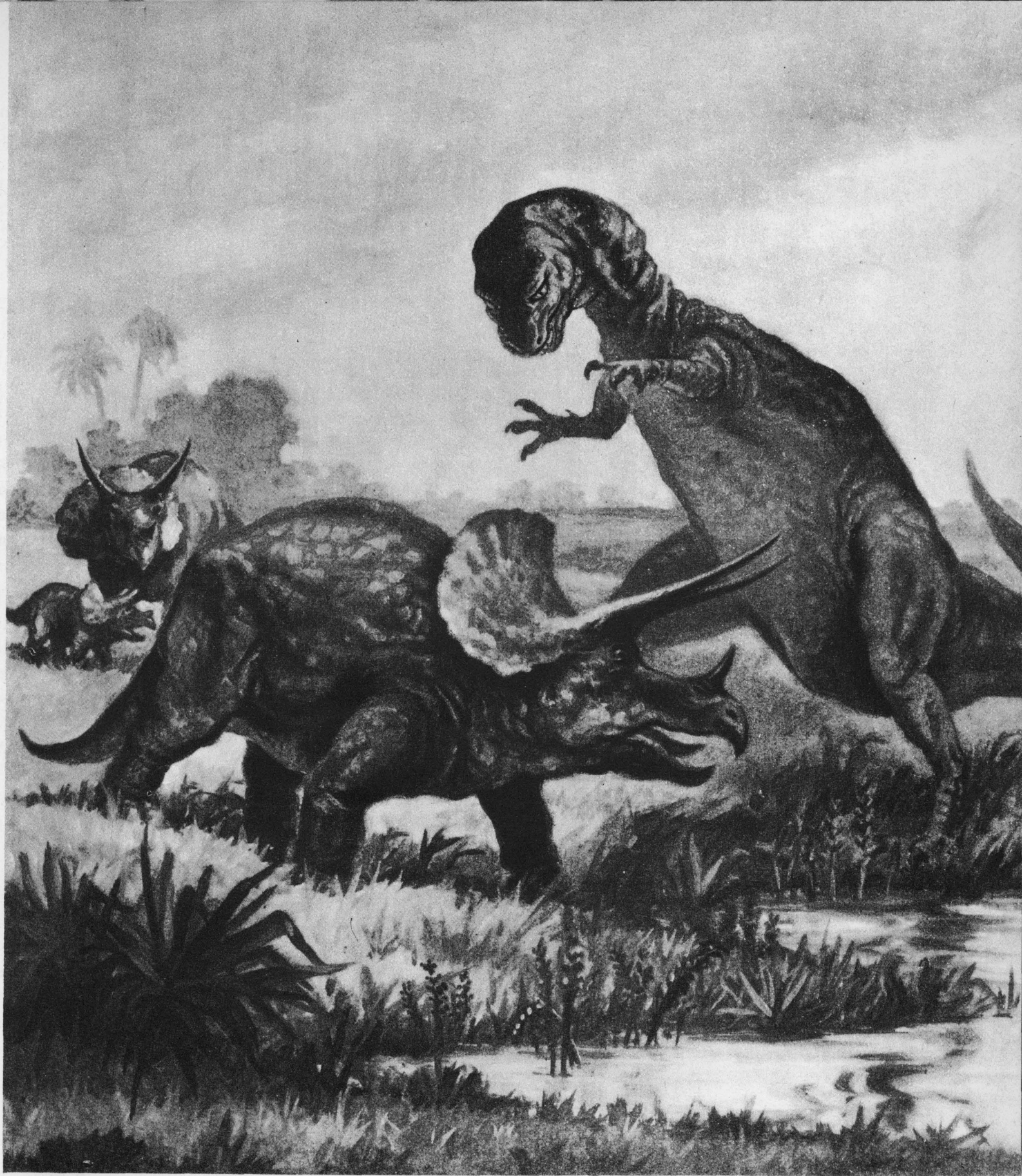
ERAS	PERIODS	CHARACTERISTIC LIFE
RECENT		Iron Age Copper Age New Stone Age
	PLEISTOCENE PLIOCENE 	Stone Age Glacial Period Man
CENOZOIC	MIOCENE OLIGOCENE EOCENE 	First Horse Mammals
	CRETACEOUS JURASSIC TRIASSIC 	Grasses First Birds Dinosaurs Reptiles of the Sea
PALAEOZOIC	PERMIAN CARBONIFEROUS DEVONIAN SILURIAN ORDOVICIAN CAMBRIAN 	Reptiles Insects Trees & Giant Ferns Sharks Fishes Sponges Corals Trilobites First Marine Fauna
	PRE-CAMBRIAN 	Metazoa (Many-Celled Animals) Protozoa (Single-Celled Animals) Primitive Invertebrates Origin of Life
		BEGINNING OF THE WORLD

Low as this small, sightless worm may seem in comparison with civilization as we know it today, nine hundred millions of years ago he literally was king of the universe and master of the Proterozoic world. But eons came and eons passed and the centuries rolled by. Restless progress, dissatisfied with her achievements, experimented along new and more diversified lines, and at last we come to the Palaeozoic Era.

In the waters that bathed the shores of the still young continents we find new and more varied forms of life. Strange creatures, who by better adaptation to their environment and by development of their powers of aggression and protection have usurped the lordship formerly held by the Annelid worm. In the Cambrian period the seas were teeming with life. The worms of the Proterozoic period increased in number and variety and to them were added many creatures, primitive ancestors of some of the species alive today. As the centuries passed in their increasing number, many changes were going on in the world. The sun rose in the morning and set again at night. The moon shone in silver radiance much as it does today, and the stars twinkled brightly over head, of course in a somewhat different arrangement. Fleecy clouds drifted idly across the blue sky, or again, rain pelted down from black clouds driven by a gale, but in these conditions alone was the world as we know it, for only in the sea was there any life. There were no trees nor bushes, no flowers nor grass, no animals and no birds. Not even an insect to relieve the quietness of the flat, uninteresting, colorless world. The only motion was in the waving of the simple green plant about eight inches high known as "liverworts."

But if life was yet to find its place on the land, it was teeming in the overcrowded sea, for by the middle of the Palaeozoic, many newcomers were making life difficult indeed for the early dwellers of the salty deep. Star fish, sea urchins, sponges and trilobites were now in abundance, and sharks and fish had both made their modest appearance which, despite their primitive form, gave promise of their later great conquest of the oceans and the final development of the vertebrate skeleton as nature's greatest structural triumph.

In the Carboniferous and Permian periods that brought the Palaeozoic Era to a close, the conquest of the land began. Possibly in the Devonian and Upper Carboniferous some vertebrates had begun to breathe air by means of lungs. No trace of them remains, but they were probably slimy sea dwellers who are represented today by frogs and newts. The effort of these creatures to free themselves from their watery environment was only partially successful, for they are still compelled to return to the water to lay their eggs. It is improbable that the first moist, smooth skinned sea



One of the most noted dinosaurs was the Triceratops, or "three horned." This creature had an extremely large head but very little in it in the form of brains. The base of the skull extended back into a large collar much in the manner of an Elizabethan ruff. Two sharp horns projected from his forehead and another horn surmounted his snout which ended in a curved beak. From the front he was well equipped for attack, but aside from this he was unprotected by armor. Many fossil remains show broken horns, some of which have healed over, proving that this creature probably engaged in fights with others of his kind. He was herbivorous and was somewhat larger than a rhinoceros.

The other formidable creature was indeed king of the dinosaurs. Though not as large as some of the great herbivorous creatures the Tyrannosaurus was carnivorous, feeding off his less agile neighbors. Standing twenty feet high and armed with huge teeth and sharp claws he was indeed a terrifying object, but of his great bulk only one pound was allotted to brain. With his powerful hind legs he could run or jump but his forelegs were of little use save for holding his prey.

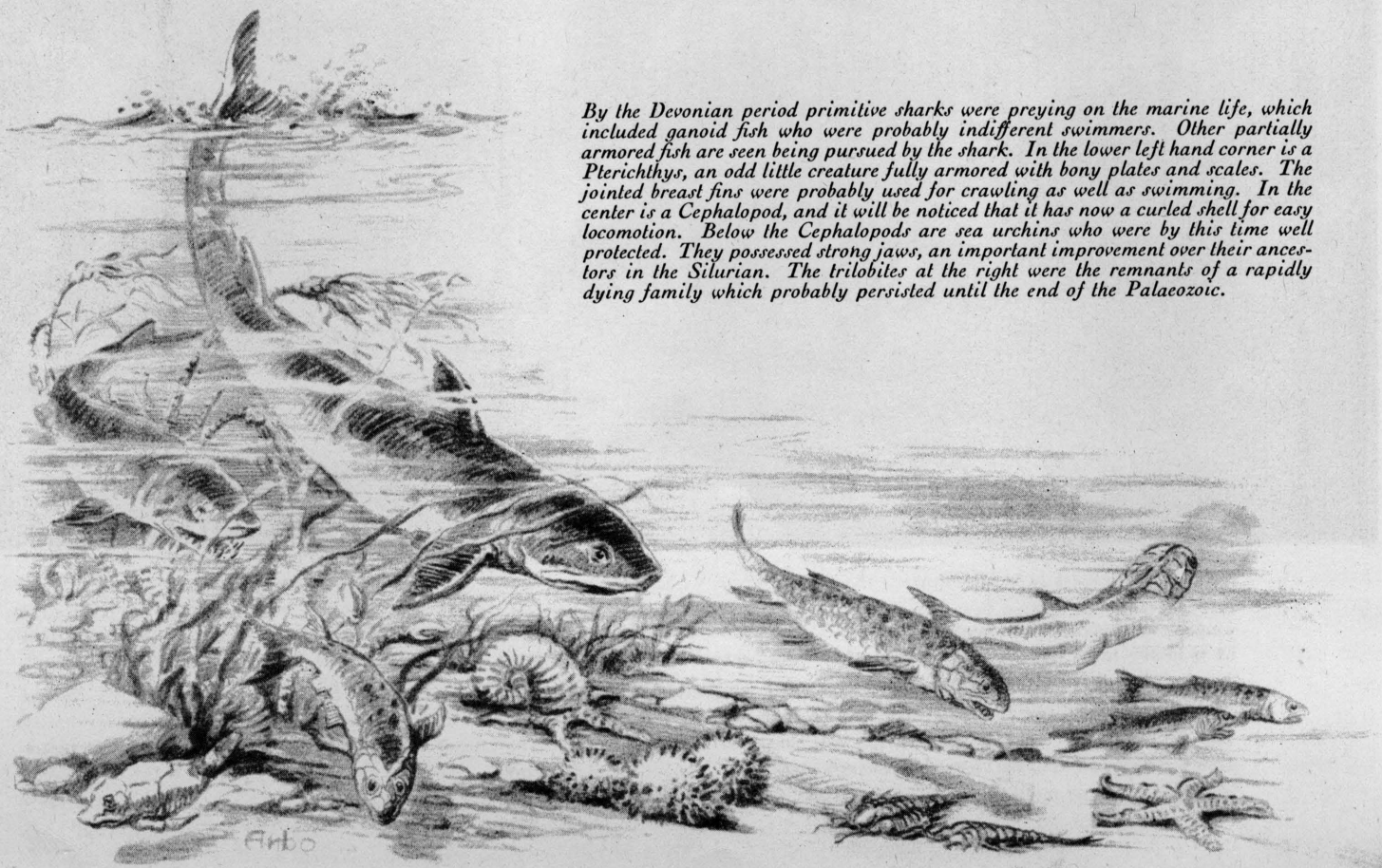


dwellers who crawled onto the land sensed what must remain the greatest triumph of exploration and discovery in the history of the world. How queer this new environment must have seemed, for from the swampy land grew giant club mosses a hundred feet high with a circle of broad leaves at the top, and beside these mosses rose great "horsetails" as tall as trees. The fiber of their trunks however, was soft and spongy, and unlike the present wood fiber of our modern trees. It was these luxuriant mosses and similar growths that later, falling and decomposing in the swamps at their feet, formed our present day coal beds. These forests must have seemed monotonous indeed, for there were no flowers or birds to add color to the drear landscape of brown trunks and green leaves. Occasionally the whirl of a dragon fly would break the silence as one of these great creatures measuring in some instances two feet across, flew by. They probably preyed on the cockroaches and other crawling insects who were proportionate in size.

But the warm, lazy life of the Carboniferous swamps was due for a violent change — a change

so great as to wipe out completely much of the early animal and plant life. Many species disappeared and others were so stunted that they never again attained their former domination. Great mountain chains were thrown up and the seas receded from the land. The whole continent of North America gradually rose. This change in topography was accompanied by an equally violent climatic change, and what had once been tropical swamps where animals basked in the steamy warmth now became barren fields covered by ice and snow. The cooling of the land and the chilling of the waters caused the greatest havoc, and millions of years elapsed before the receding glaciers and gradually warming climate again made possible the luxurious life of the tropics.

But it is a new actor who crosses the stage with our entry into the Mesozoic era. A queer, ugly creature who in many and varied forms stalked through the succeeding centuries with the stage almost to himself. Whereas the early Palaeozoic was ruled by invertebrates and the later Palaeozoic by primitive fish, sharks and amphibians, the Mesozoic was dominated by reptiles — beasts of



By the Devonian period primitive sharks were preying on the marine life, which included ganoid fish who were probably indifferent swimmers. Other partially armored fish are seen being pursued by the shark. In the lower left hand corner is a Pterichthys, an odd little creature fully armored with bony plates and scales. The jointed breast fins were probably used for crawling as well as swimming. In the center is a Cephalopod, and it will be noticed that it has now a curled shell for easy locomotion. Below the Cephalopods are sea urchins who were by this time well protected. They possessed strong jaws, an important improvement over their ancestors in the Silurian. The trilobites at the right were the remnants of a rapidly dying family which probably persisted until the end of the Palaeozoic.



Perhaps the largest of all dinosaurs is the Brontosaurus who grew to a length of seventy feet and who weighed upwards of forty tons. His name means "thunder lizzard" and he probably wallowed in the water, eating aquatic plants, for so great was his weight that his progress over dry land must have been difficult indeed. His long neck was very flexible, and was counterbalanced by a heavy tail. No bridge builder has met the problem of stress and strain more efficiently than nature did in this creature. The wonder is that such a small head could gather enough green fodder in a day to support such a bulk, but being cold blooded and sluggish the Brontosaurus probably did not require as much food as a warm blooded cow or horse.

The other creature was the pride of the armored dinosaurs, Stegosaurus. He appeared at the end of the Jurassic and was larger than an elephant. His short forelegs brought his head close to the ground where he grazed on the grasses and low bushes. Great bony plates standing on edge rose in two rows down his back and his skin was a series of bumps covered by hardened nodules. On his tail he carried murderous spikes, probably for protection. The brain of this mountainous creature was actually smaller than that of a puppy. In fact so insufficient was it that nature had to install a branch brain in its hind quarters to keep his rear following in the direction that the head intended going.

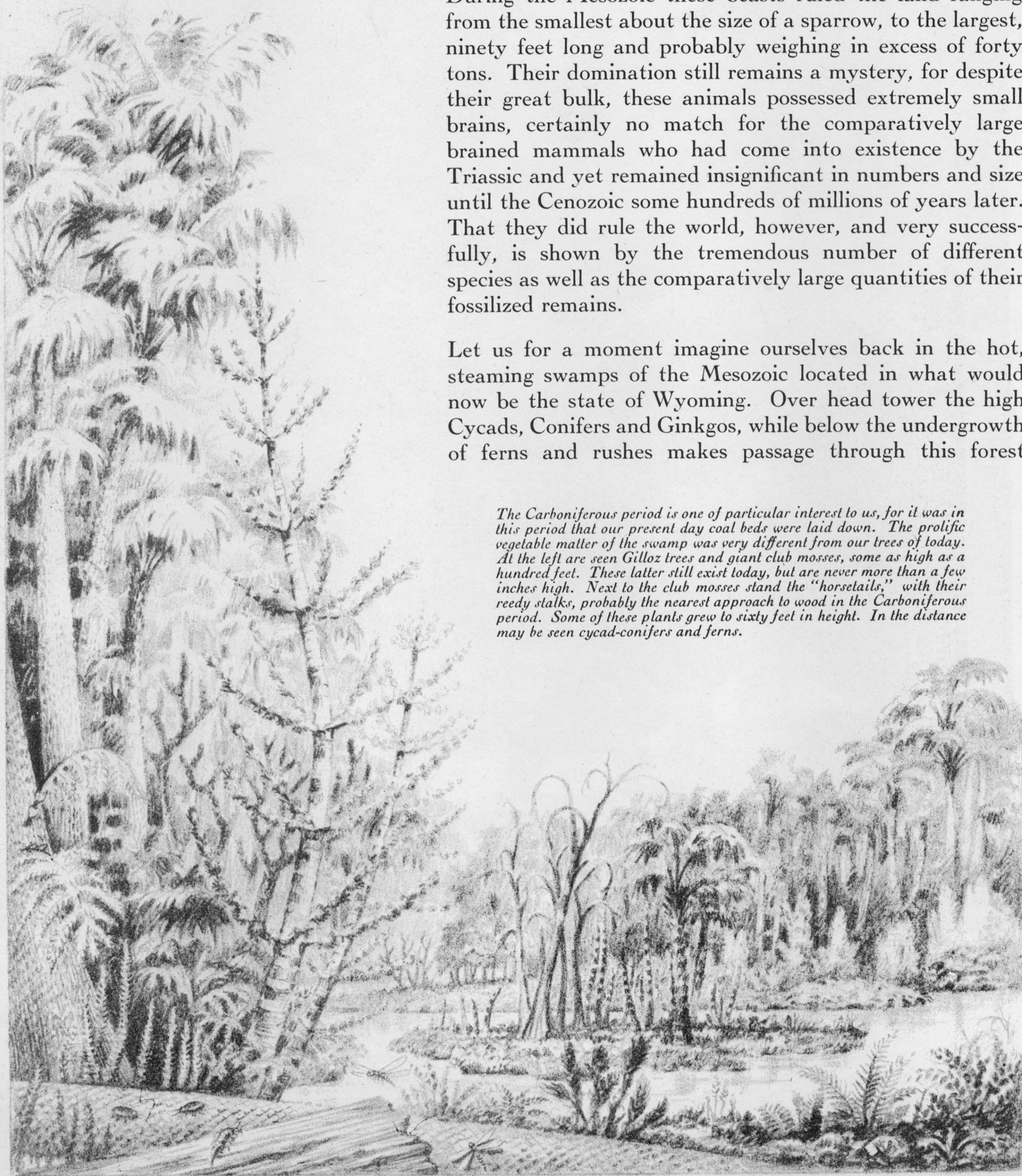
strange, bizzarre shapes, great in bulk but small in brain, who roamed the swamps and plains, swam in the rivers and oceans and even flew through the air. Despite the conquest of the land by the amphibians in the late Palaeozoic, it was the dinosaurs of the Mesozoic who were the first true land vertebrates. From the

amphibians who of necessity returned to the water to lay their eggs, evolution produced an animal, no longer tied to its former aquatic home, whose eggs held a liquid protected by a shell to prevent their drying out and yet sufficiently porous to permit oxygen to reach the embryo.

It is possible that the wide climatic changes of the Permian stimulated the development of reptiles, for by the Upper Mesozoic era the principal dinosaur groups were present. During the Mesozoic these beasts ruled the land ranging from the smallest about the size of a sparrow, to the largest, ninety feet long and probably weighing in excess of forty tons. Their domination still remains a mystery, for despite their great bulk, these animals possessed extremely small brains, certainly no match for the comparatively large brained mammals who had come into existence by the Triassic and yet remained insignificant in numbers and size until the Cenozoic some hundreds of millions of years later. That they did rule the world, however, and very successfully, is shown by the tremendous number of different species as well as the comparatively large quantities of their fossilized remains.

Let us for a moment imagine ourselves back in the hot, steaming swamps of the Mesozoic located in what would now be the state of Wyoming. Over head tower the high Cycads, Conifers and Ginkgos, while below the undergrowth of ferns and rushes makes passage through this forest

The Carboniferous period is one of particular interest to us, for it was in this period that our present day coal beds were laid down. The prolific vegetable matter of the swamp was very different from our trees of today. At the left are seen Gilloz trees and giant club mosses, some as high as a hundred feet. These latter still exist today, but are never more than a few inches high. Next to the club mosses stand the "horsetails," with their reedy stalks, probably the nearest approach to wood in the Carboniferous period. Some of these plants grew to sixty feet in height. In the distance may be seen cycad-conifers and ferns.

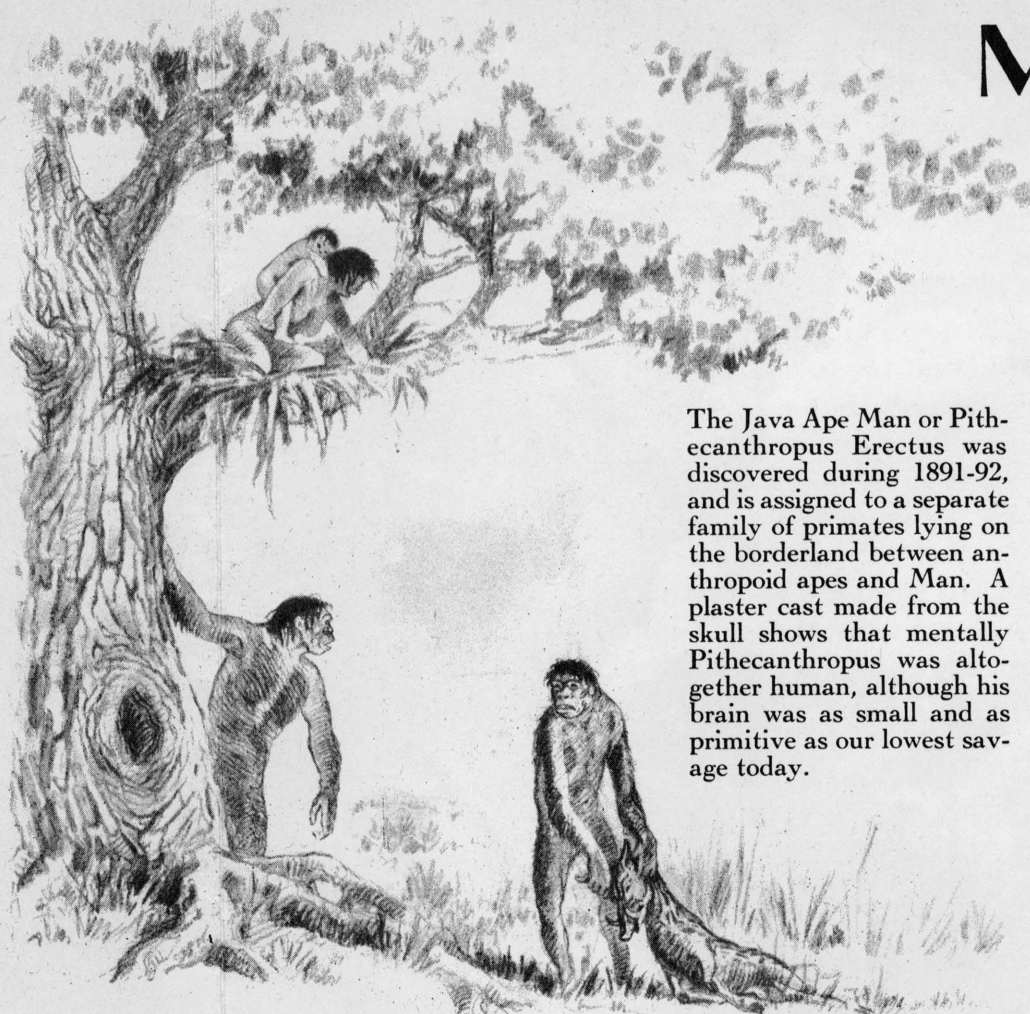




Sporting on the beach by the sea are a herd of Dimetrodons, one of the queerest creatures that ever lived. They appeared in the Triassic and preyed upon other small lizards of that period. With large jaws armed with tusks and sharp teeth they made anything but a pleasant appearance. The most characteristic feature of the Dimetrodon, however, was the great fin which rose from its back. The purpose of such an appendage defies the imagination. Like all his relatives, this creature was stupid, dull witted and slow.

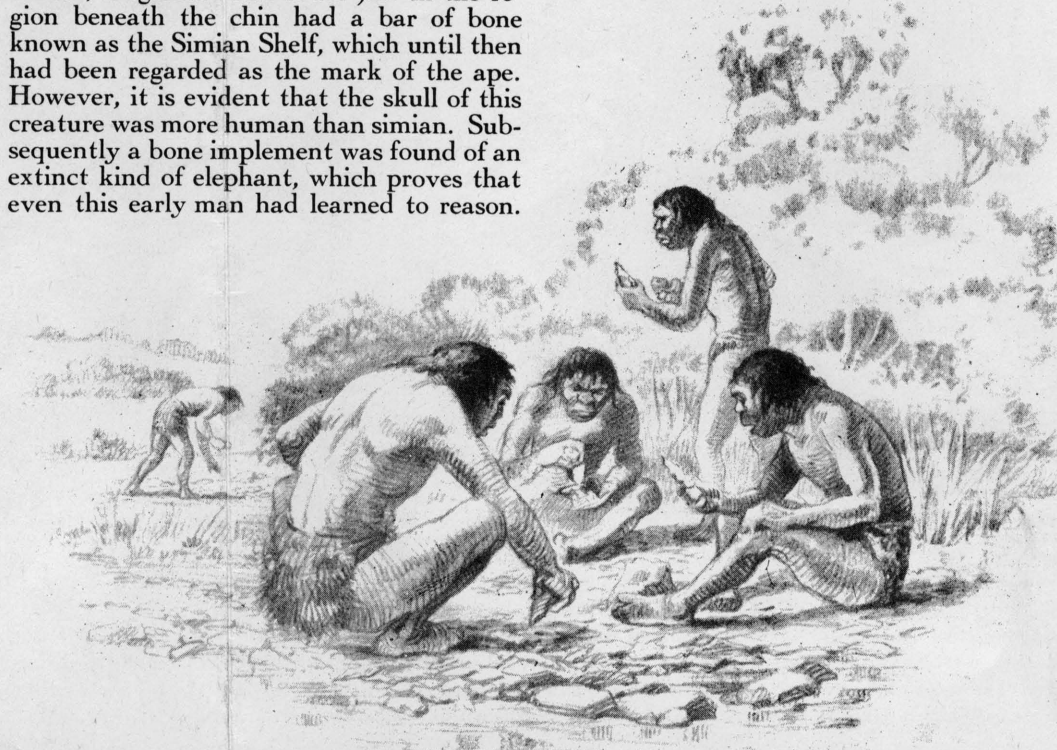
On the rocks above is shown a rookery of Pterodactyls who lived in the Jurassic. These flying reptiles represent the dinosaur's attempt to conquer the air. Their elongated little finger formed the support of a skin membrane and the other fingers became sharp claws which assisted the creature in clambering up rocks and through the trees. The long pointed jaws were filled with teeth and it is probable that these creatures fed mostly on fish. In some forms these creatures had a long tail while in others the tail was absent.

MAN THROUGH THE AGES



The Java Ape Man or Pithecanthropus Erectus was discovered during 1891-92, and is assigned to a separate family of primates lying on the borderland between anthropoid apes and Man. A plaster cast made from the skull shows that mentally Pithecanthropus was altogether human, although his brain was as small and as primitive as our lowest savage today.

The Piltdown Man, or Eoanthropus, was discovered between 1911-15 at Piltdown, Sussex, England. The lower jaw in the region beneath the chin had a bar of bone known as the Simian Shelf, which until then had been regarded as the mark of the ape. However, it is evident that the skull of this creature was more human than simian. Subsequently a bone implement was found of an extinct kind of elephant, which proves that even this early man had learned to reason.



It is probable that the Piltdown Man made crude tools from flint. These eoliths, however, are so crudely made that some scientists argue that they were caused by nature rather than by the handiwork of man.



ALL known animals fall into major classifications. For example the genus felis contains besides such jungle beasts as the lion, tiger, leopard, etc., our common house cat. So man as an animal falls into the classification of primates. In the same group we find the lemurs, monkeys, gorillas, etc., but this does not mean that man has descended from the monkey any more than it means that the monkey has descended from man. It is probable that centuries ago, very likely at the beginning of the Cenozoic, there lived a small unfortunate creature who possessed no means of defense and who was so poorly constructed that even rapid flight was out of the question. His only method of protection was to take to the trees, and it is likely that he was arboreal in habits, living as best he could from the nuts and fruits that he could obtain. This creature, however, possessed a trait which all other animals lacked — he was able to reason. From these early beginnings man probably sprang. Our first traces of him, however, are not found until the Pliocene and even these bones are so fragmentary that there has been considerable argument as to their exact nature. This Pliocene Man is better known as the Java Ape Man, for his bones were found on the island of Java. The teeth and thigh bone possess simian characteristics, and the large eye ridges also are simian, but the brain of this prehistoric man was much larger than the known brain of any monkey being only slightly smaller than the brain of our lowest savages.

The next traces of man are probably in the Pleistocene and were found in England. These remains are almost as fragmentary as those of the Java Ape Man, but from them has been reconstructed the Piltdown Man, who marks the second step in the evolution of this race. It is probable that this creature had learned to shape stone crudely to his needs, and it is possible that he even knew the use of fire. The heavy eye ridges of the Java Man had become modified and the simian-like teeth and lower jaw had also changed, becoming more human in aspect. The first complete skeleton of prehistoric man that we have found, dates back to the middle or late Pleistocene. He was short of stature, although heavily built, and somewhat stooped. His head sat on a short, thick neck. While still possessing heavy eye ridges he was far more human in aspect than the Java Man, and he had learned the use of stone for implements. Spears and hammers of stone have been found with his remains. This Neanderthal Man also knew the use of fire and had descended from trees and was living in caves, as is shown by the debris that has been found about his former home. He is contemporaneous with the saber-tooth tiger, woolly rhinoceros and mammoth and had learned to trap and kill these brutes to furnish him with food and clothing. This race disappeared completely and was followed by a new and far better developed creature, the Cro-Magnon Man. Much taller and of far more human appearance, this prehistoric race of men lived in caves throughout Europe. In addition to well made weapons and tools they possessed considerable artistic ability and many of the caves throughout France have been decorated with well drawn pictures of prehistoric animals, showing that they were familiar with these creatures.

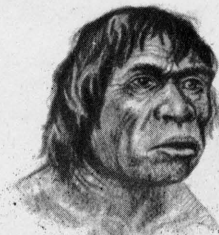
There followed an even better developed race of men who learned the art of making pottery and the domestication of animals. These men lived in villages built upon piles in lakes and are better known as Lake Dwellers.

Gradually man learned the use of metals and the Stone Age was followed by the Bronze Age, which later gave way to the Iron Age after man had learned the art of smelting. This brings us to the dawn of history, for it was not long after learning the use of iron that man also learned the art of making written records.

In North America there are no remains of man earlier than the Pleistocene, where stone weapons have been found associated with bones of such extinct animals as the mastodon and sloth. Whether man was contemporaneous with these animals or whether he came later and his stone implements became mixed with these earlier bones is a question that has not been satisfactorily answered.



Pithecanthropus Erectus or Java Ape Man



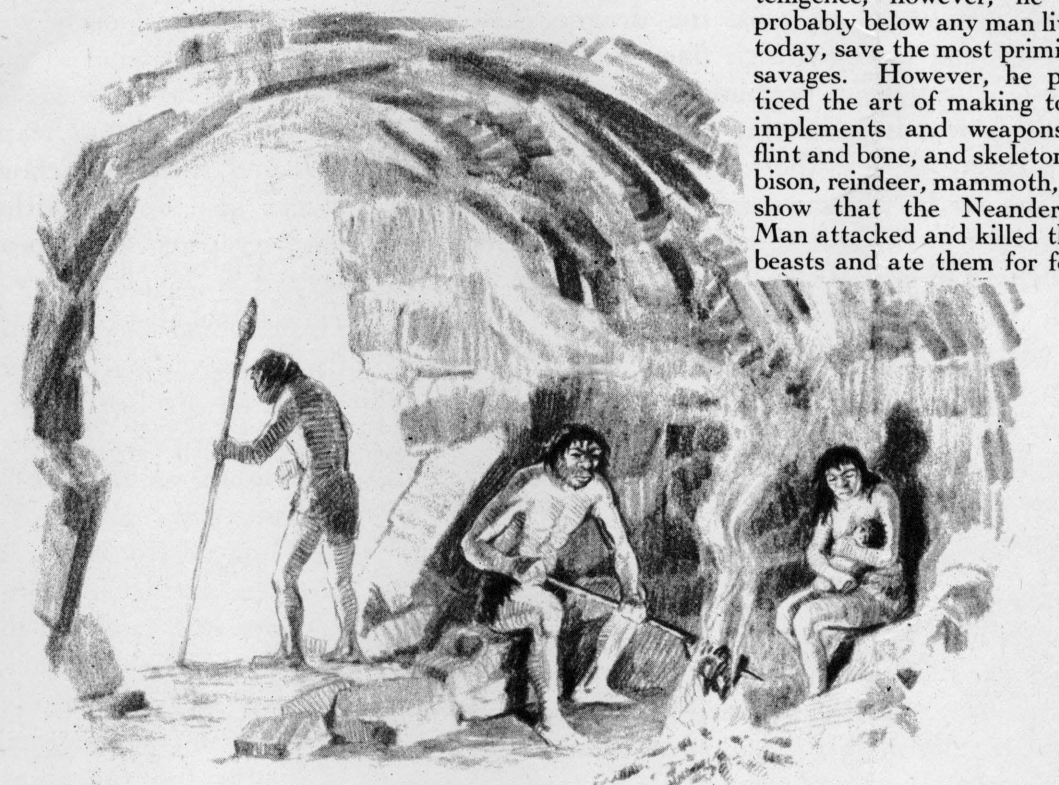
Eoanthropus, or Piltdown Man



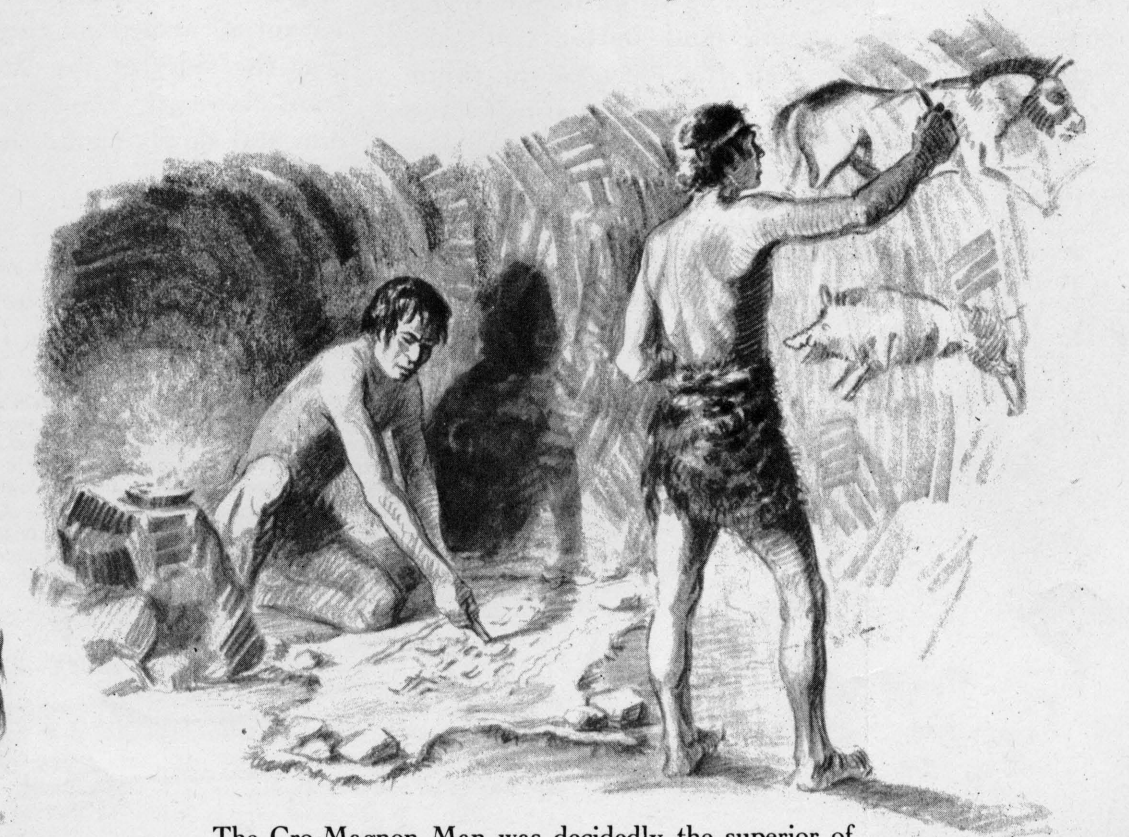
Neanderthal Man



Cro-Magnon Man



The Neanderthal Man was the sole occupant of Europe during the middle Pleistocene. He was squat, burly, big headed, thick skulled, with brows projecting over cavernous eyes. In intelligence, however, he was probably below any man living today, save the most primitive savages. However, he practiced the art of making tools, implements and weapons of flint and bone, and skeletons of bison, reindeer, mammoth, etc. show that the Neanderthal Man attacked and killed these beasts and ate them for food.



The Cro-Magnon Man was decidedly the superior of any of his predecessors in mentality. His brow ridges were inconspicuous and his head quite modern in contour. He lived throughout Europe and besides developing the use of bone and flint into well made implements he established a primitive form of art.



extremely difficult. Occasionally the branches of the trees are disturbed by the flight of Pterodactyls or winged lizards, their long pointed jaws armed with teeth to seize the dragon flies and other winged insects which dart rapidly through the air. Through an opening we catch sight of a muddy hole where in the slimy ooze wallows a great Brontosaurus, the largest animal that ever trod the earth. His mountainous body is partially submerged in the soft slime, and his tail stretches out behind him, balancing the long neck and small head. Occasionally he nibbles at the ferns along the edge and munches them slowly, their long green stems trailing downward from his jaws, or again, spying some tidbit in a tree over head he raises his neck twenty or thirty feet and seizes the choice morsel in his jaws. A miasma of heat shimmers over the brackish water.

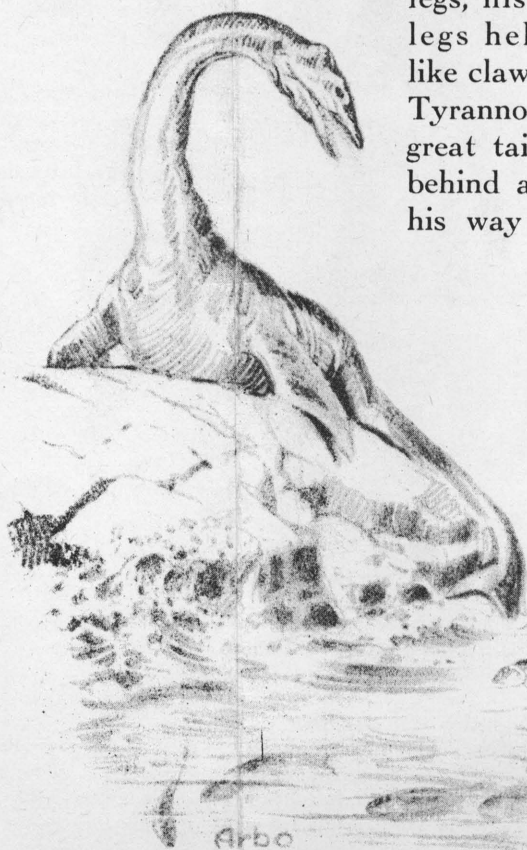
But the peaceful scene is suddenly changed to one of tragedy. The Brontosaurus jerks his small round head in frightened alarm. A sound has reached his ears bringing anxiety to his slow beating heart. Through the giant ferns and mosses he has seen an object sufficient to strike terror to the soul of a far more agile and better equipped fighter. Stalking through the trees on his hind

legs, his small fore-legs held in front like claws, is a huge Tyrannosaurus. His great tail lashes out behind as he makes his way forward in

long leaps, his large barrel-like head swinging from side to side, his powerful jaws open, displaying rows of formidable teeth. True, his height of thirty feet compares poorly with the bulk of the Brontosaurus, but what he lacks in size he makes up in fighting ability, for this huge carnivorous dinosaur can spring in great leaps with his powerful hind legs and their long claws are designed to tear to pieces any object within their reach. And the Brontosaurus, lying peacefully in the swamp, is indeed his helpless prey.

Huge though the bulk of this Brontosaurus, he is decidedly dullwitted and stupid due to his small brain, hardly larger than a man's fist. Nor is his great, lumbering frame designed for rapidity of motion, for as he turns toward the Tyrannosaurus his adversary leaps. The Brontosaurus tries to jerk himself free of the slime in which he is lying, but too late. The Tyrannosaurus has landed on his back and fastened sharp teeth in the throat of his prospective dinner. The stupid, terrified monster struggles to escape. The slime and ooze of the swamp are churned to a froth by this struggle of giants, but the great hind feet of the Tyrannosaurus, armed as they are with strong claws, tear the sides of the Brontosaurus and his small front claws grip the throat of the creature beneath him and slowly choke the life out of the largest of all reptiles.

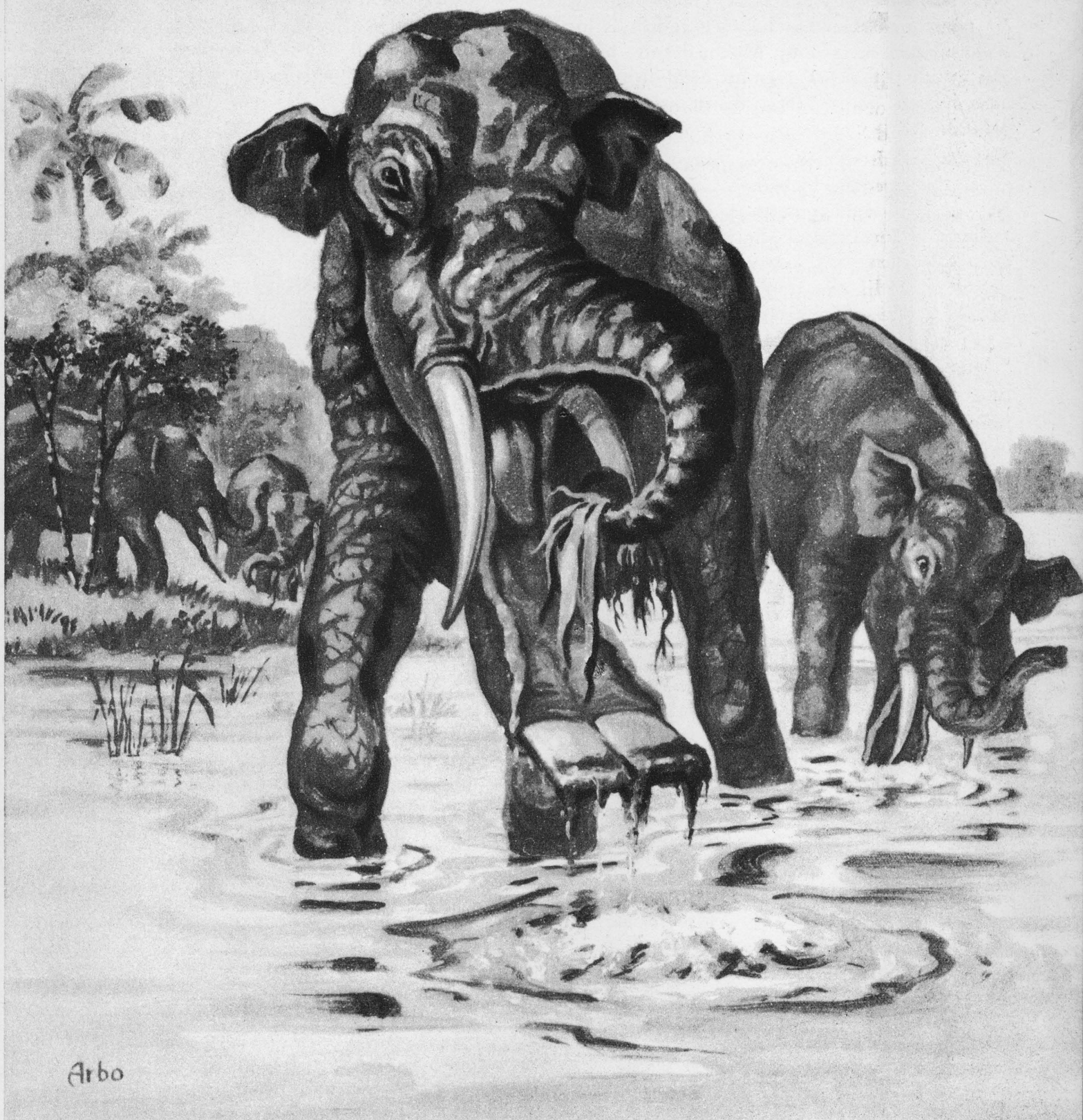
But this is not the end of the struggle. The Brontosaurus dead, the Tyrannosaurus, gorged and sleepy, tries to gain the edge of the swamp, but the agility which made it possible for him to leap



Some dinosaurs took to the sea, prominent among them being the Plesiosaurs. One of these creatures is seen on a rock, its long neck turned while it searches for its dinner. These creatures were first found in the Triassic but it was during the Jurassic that they reached their maximum development, attaining a length of thirty feet. They probably did not lay eggs but produced their young alive.

Below is seen an Ichthyosaurus, another queer reptilian dweller of the sea. He had a short neck and long jaws armed with sharp teeth. Like the Plesiosaurus, they first appeared in the Triassic and reached their maximum development in the Jurassic, during which period they attained a length of forty feet.





One of the most interesting race of mammals is the line of elephants. These have shown such variety and adaptation that fossils have been found throughout the world. The earliest representative is the *Moeritherium*, an animal about the size of a pig who lived in the Eocene. By the end of the Eocene this creature had developed into the *Palaeomastodon* and the trunk while much shorter than in our present elephant, was already noticeable.

In the picture above we show a much later elephant, the *Platybelodon*, found by Roy Chapman Andrews in the Gobi in 1930. This animal, better known as the Shovel Jawed Elephant, had a long lower jaw armed at the end with flat, broad teeth. These made it possible for him to scrape the bottoms of shallow lakes and ponds and bring up weeds and grasses, of which he was probably fond. It will be noted that the prehensile nose has lengthened and the tusks show the downward curve which in later forms straightened and finally turned upward.

to the back of the Brontosaurus is no longer his. Weighted down by his heavy meal, the Tyrannosaurus misjudges his distance and finds himself embedded in the swamp which, despite his struggles, gradually closes over his head — and nature has written “finis” to a death struggle of the Mesozoic.

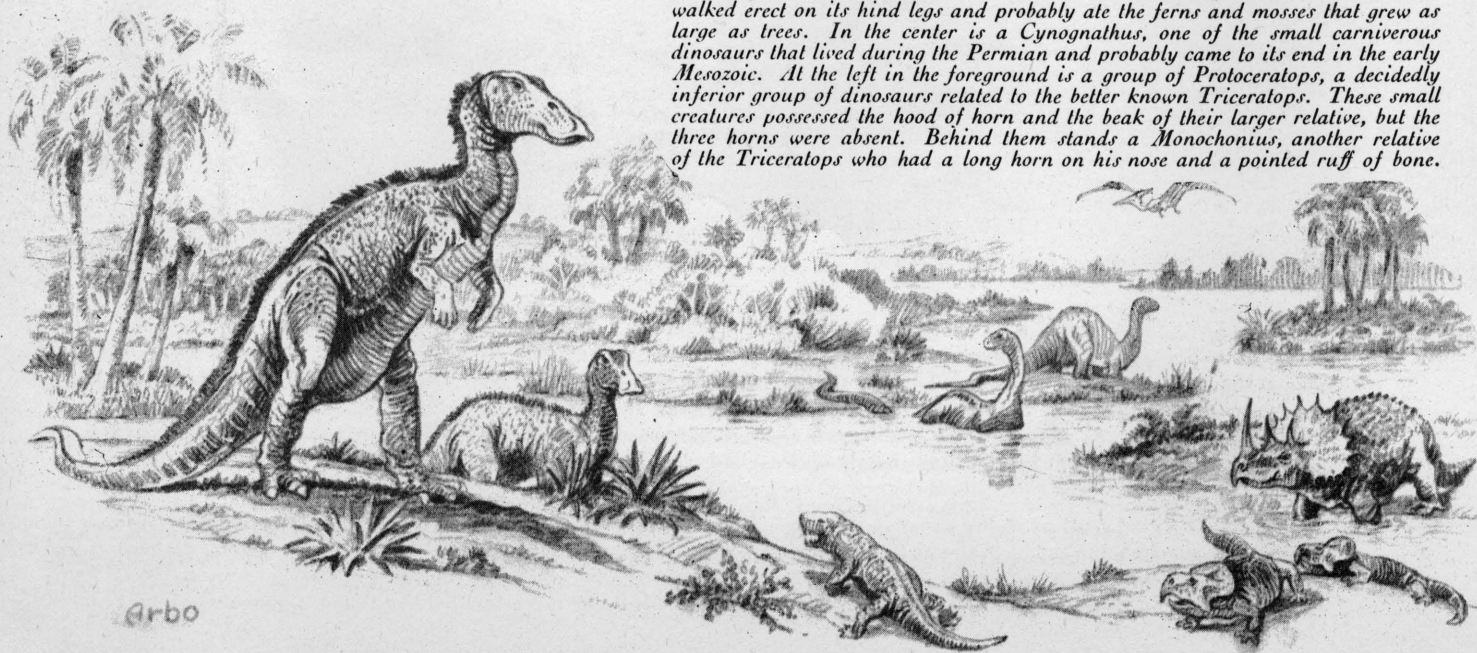
The remains of the Brontosaurus and the Tyrannosaurus gradually settle deeper and deeper into the swamp. Mud and silt close over their forms. Millions of years pass during which time the world sees countless changes. Gradually the swamp which marks the tomb of these monsters of the Mesozoic, dries up and slowly nature heaves this whole vast area high above sea level. Under the arid atmosphere the ferns and mosses wither and turn to dust. The sun beats down upon a dry, parched desert and what was once a swamp is now covered by hundreds of feet of desert sand and clay which, under tremendous pressure has turned to stone. And again nature marks this area for a change. The ground is split asunder, the earth is vaulted, and the bones of the two dinosaurs that were buried so many centuries ago, are exposed to the weathering of the wind. And so it is that Palaeontologists from universities, searching this area for traces of the past, find entombed in solid rock the skeletons of these prehistoric monsters. It is their arduous task to cut these masses of stone from the cliffs, pack them carefully as eggs and ship them back to museums. Here with delicate tools other scientists slowly and laboriously pick the stone away from the skeletons, a task sometimes requiring many months to free one bone. The skeleton of the Brontosaurus, now risen from its rocky tomb, is reconstructed just as it was back

in the Mesozoic, and is mounted and placed on display for other scientists to examine.

But to return to our Mesozoic swamp. Under the warm climate and favorable living conditions the reptilian lords of the earth grew in number and diversification. By the Upper Cretaceous they had spread throughout the world and traces of these animal giants have been found on every continent. The seas held their monsters, too, in the Plesiosaur, Mosasaur and Ichthyosaur, and the land dinosaurs, such as the Triceratops with its great horns and hood of bone, the Stegosaur with its ruffled back of armored spines, and the Trachodon with its odd, duck bill were weird creatures indeed. Then suddenly, the earth, so long at rest, broke into new convulsions. Mountains were folded over, plateaus were raised and the great ocean beds depressed. A change in ocean currents and climate took place with the natural result that the highly specialized animals that had dominated the soft, easy life of the Mesozoic, found themselves unable to withstand the new rigors of climate, and gradually disappeared. Thus ended the great reptilian order, save for a few remaining survivors of this lost race, the crocodile, lizard, turtle and snake.

There followed at the start of the Cenozoic another epoch of cold and ice and snow. North America and Europe were covered with continental ice sheets. Almost half of the vegetation of the Cretaceous died, unable to adapt itself to the new conditions. In fact so completely was the typical life of the Mesozoic wiped out that it can only partially be accounted for by the change in climatic conditions. The other causes remain a mystery.

At the left is seen the Trachodon, or duck-billed dinosaur, an odd creature which walked erect on its hind legs and probably ate the ferns and mosses that grew as large as trees. In the center is a Cynognathus, one of the small carnivorous dinosaurs that lived during the Permian and probably came to its end in the early Mesozoic. At the left in the foreground is a group of Protoceratops, a decidedly inferior group of dinosaurs related to the better known Triceratops. These small creatures possessed the hood of horn and the beak of their larger relative, but the three horns were absent. Behind them stands a Monoclonius, another relative of the Triceratops who had a long horn on his nose and a pointed ruff of bone.





In the Oligocene there developed a decidedly cat-like animal some of whom were slenderly limbed with the upper canines so far developed as to earn them the name "Saber-tooth Tigers." This race rapidly developed, becoming much heavier and with their terrible weapons more and more elongated. Against these tusks even the thick-skinned herbivora had no protection. That they were well adapted to live in the Miocene and Pliocene is shown by their increase in numbers and their spreading to practically every continent then existing. As they grew heavier their speed diminished, but it is probable that they possessed great stealth for seizing their prey, which by this time was bountiful. Developing both in size and in intelligence they came to their end sometime in the Pleistocene and were, therefore, contemporary with early Man.

The other dull-witted creature shown above is the Great Sloth, *Megatherium*. These creatures abounded in a variety of forms in the Miocene, reaching the climax in the Pliocene and Pleistocene. The Sloth had heavy hind quarters with a lighter forepart of the body, which enabled him to stand erect and pull down branches of trees with his great claws. He walked awkwardly on all fours and was clothed in heavy, coarse fur. Many of them were quite small creatures, but the giant shown above when erect on his hind legs, stood twenty-five feet tall.

At the beginning of the Cenozoic, mammals were assuming a new importance in the world. For many centuries they were very small and primitive and showed little promise of their eventual development, and it was not until the Eocene, that the migration of large brained mammals began, both in North America and in Europe. It is probable that they originated in Asia and from there found their way to the other continents. Certain it is that by the end of their migration, the orders were definitely established. The characteristics of adaptation possessed by many of the new inhabitants made it possible for them to flourish even under the rigorous conditions then existing, and gradually through the following era, the Oligocene, their development continued, reaching its climax in the Miocene.

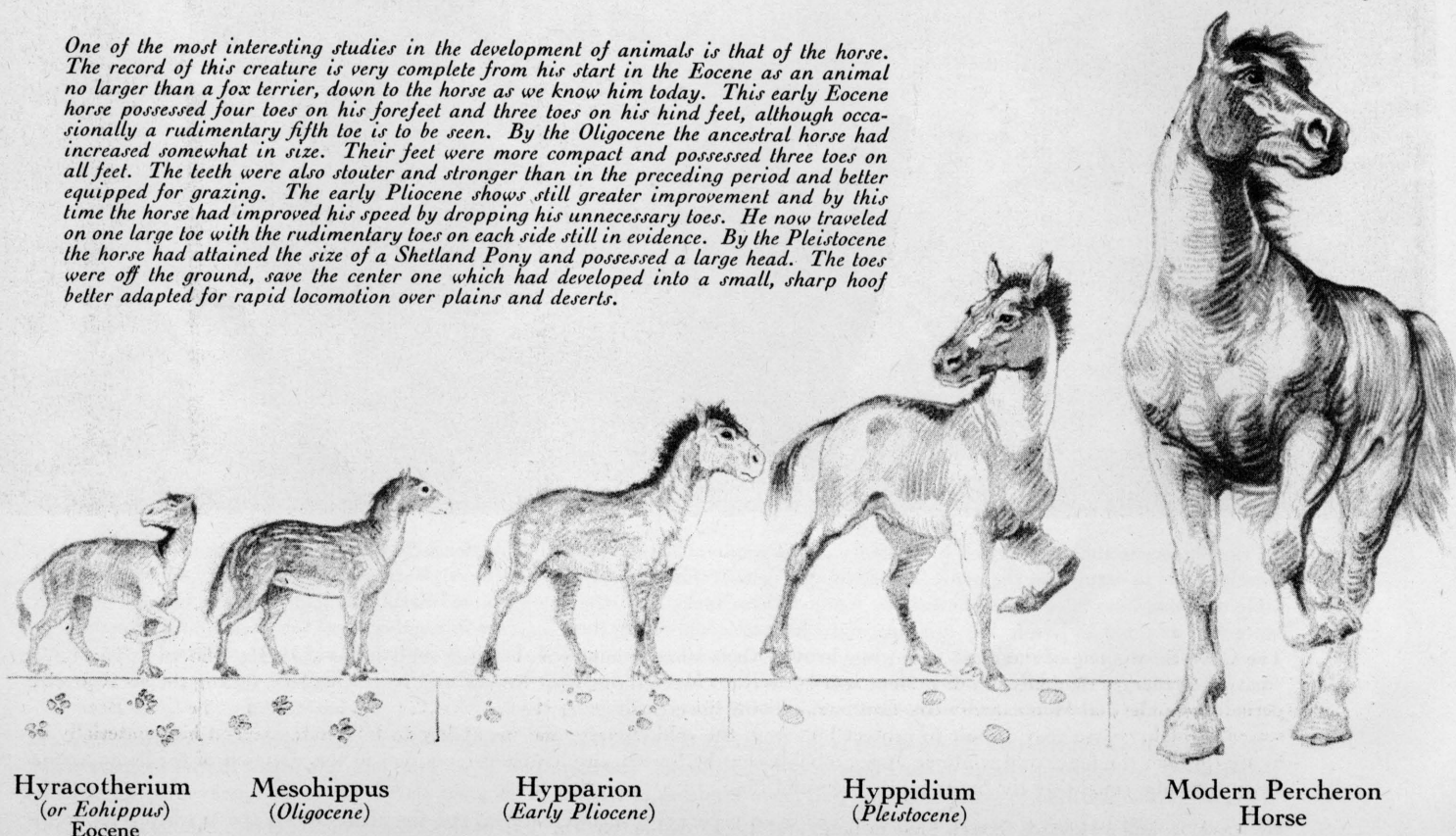
The earliest primitive animals were egg laying forms of a very low order. These were followed by the marsupials, which form is still existent in our present opossum and kangaroo.

The next step in the line of evolution was the insectivora, animals whose food consisted mainly of insects and worms. Our present moles and shrews belong to this classification. From these early beginnings, animals rapidly developed, and our true carnivora came into being. The rapid diversification of the various families led quickly to their mastering of the world as it existed in the Miocene. By this time the hairy mammoth and the woolly rhinoceros were ranging the northern

tundras of Europe and America, and farther south the small ancestor of our present horse scampered over the plains. The saber-tooth tiger, formidable adversary of early Man, had sprung into being and throughout the southern part of North America and in South America, the giant sloth ruled as king, in size at least, of the existing mammals. Practically all of the forms then existent are now extinct, many of them having passed down to their descendants characteristics more suitable in combating a changing world. It is interesting to note, however, that some, the mammoth in particular, lived to such a recent date that their bodies have been entombed in ice and have furnished food for the dogs of northern explorers. By the Miocene practically all the animals we know today had been established and had behind them many centuries of development.

The following period, the Pliocene, is noted primarily for the first traces of human inhabitation of the earth. So close in relationship was early man to his animal ancestors that it is sometimes difficult to draw a definite line as to whether the remains are animal or human in character. The earliest bones which definitely point to human characteristics are those found in the Pliocene. However, they are so very scanty, being nothing more than the upper portion of a skull, a thigh bone and three teeth, that the life of this primitive human can hardly more than be guessed at. It is not until the Pleistocene that traces of early Man

One of the most interesting studies in the development of animals is that of the horse. The record of this creature is very complete from his start in the Eocene as an animal no larger than a fox terrier, down to the horse as we know him today. This early Eocene horse possessed four toes on his forefeet and three toes on his hind feet, although occasionally a rudimentary fifth toe is to be seen. By the Oligocene the ancestral horse had increased somewhat in size. Their feet were more compact and possessed three toes on all feet. The teeth were also stouter and stronger than in the preceding period and better equipped for grazing. The early Pliocene shows still greater improvement and by this time the horse had improved his speed by dropping his unnecessary toes. He now traveled on one large toe with the rudimentary toes on each side still in evidence. By the Pleistocene the horse had attained the size of a Shetland Pony and possessed a large head. The toes were off the ground, save the center one which had developed into a small, sharp hoof better adapted for rapid locomotion over plains and deserts.





The Cave Bear is one of the most recent mammals. No fossilized remains have been found earlier than the Pliocene. This huge creature, far larger than any of our present species, lived in caves throughout Europe and North America during the great glacial period. Neanderthal Man came in constant conflict with the creature over the use of caves as a habitation. The Cave Bear possessed a thick, coarse coat of hair to protect him from the cold climate, and his ability to hibernate assisted him materially in living through the long, cold winters. It is probable that he found considerable competition in the selection of his home as the caves were also sought by the Saber-tooth Tiger and Man.

He was slow and awkward, though huge in bulk, and it is probable that the flesh of this bear formed a choice change in the Cave Man's diet. Once one of these creatures was killed he would serve as food for many weeks.

are found in sufficient quantities to furnish us fairly complete data on his early life. By that time the Cave Man knew the use of fire, had developed implements rudely fashioned out of stone, and by intelligence alone had made himself master of the animal kingdom.

By the Pleistocene we reach the dawn of civilization. At that time nearly all of the present wild animals known in North America were in existence, and in addition there were many other species which have since disappeared. Four separate species of elephants, including the mastodon, roamed the forests and plains of this continent. This latter animal lived to such a recent period that it was probably known to the early Indians. Hoofed animals were also abundant, including many species of horses which afterward became extinct on this continent. Our living bison, the buffalo, was also present. Practically all forms of carnivora that exist today were known, and in addition the now extinct saber-tooth tiger ranged throughout North America and was probably the most formidable beast of this epoch. The giant sloth, *Megatherium*, as large as our present elephant, was found in southern United States and South America and is represented today only by much stunted species.

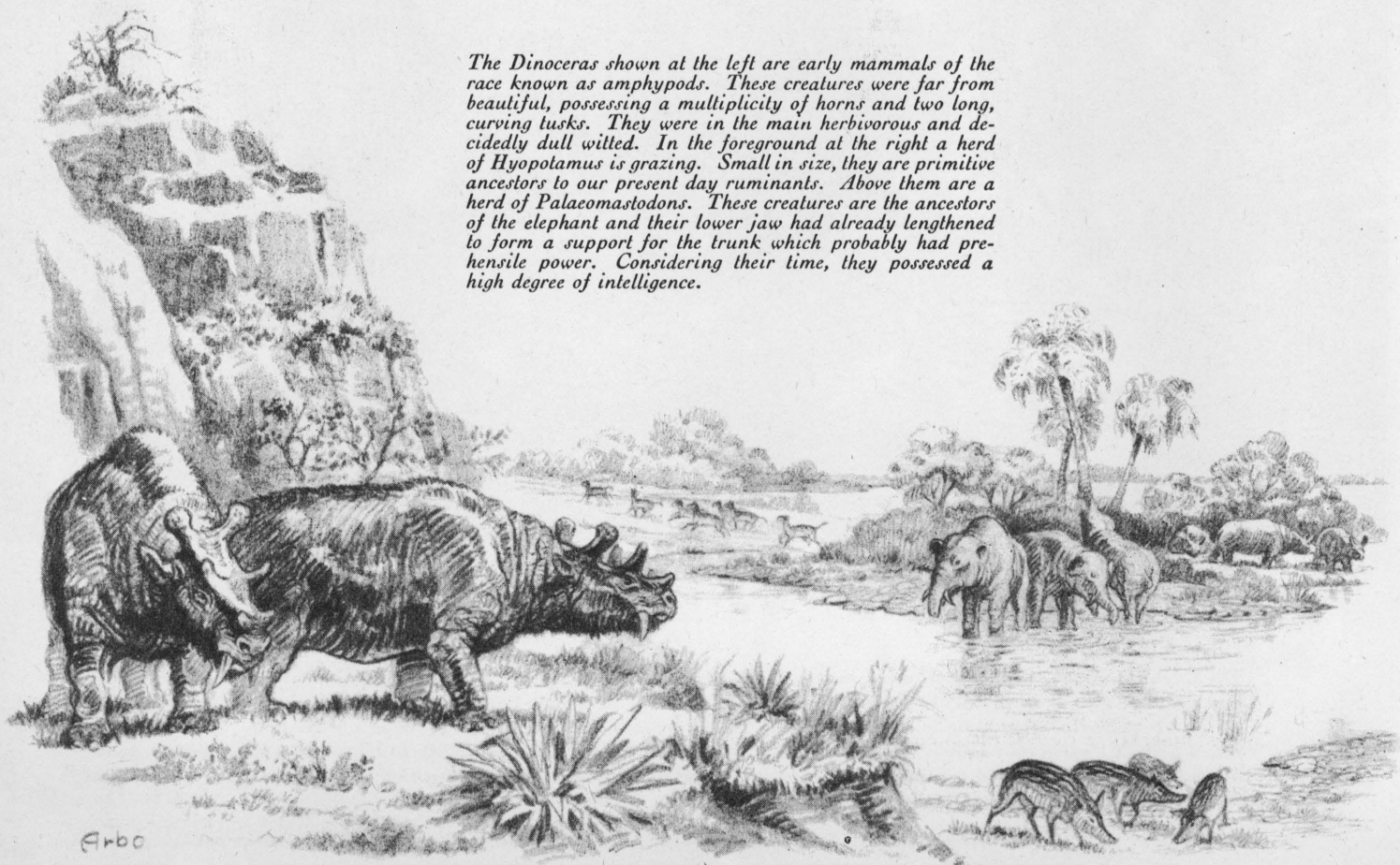
Plant life had finally reached the stage where we

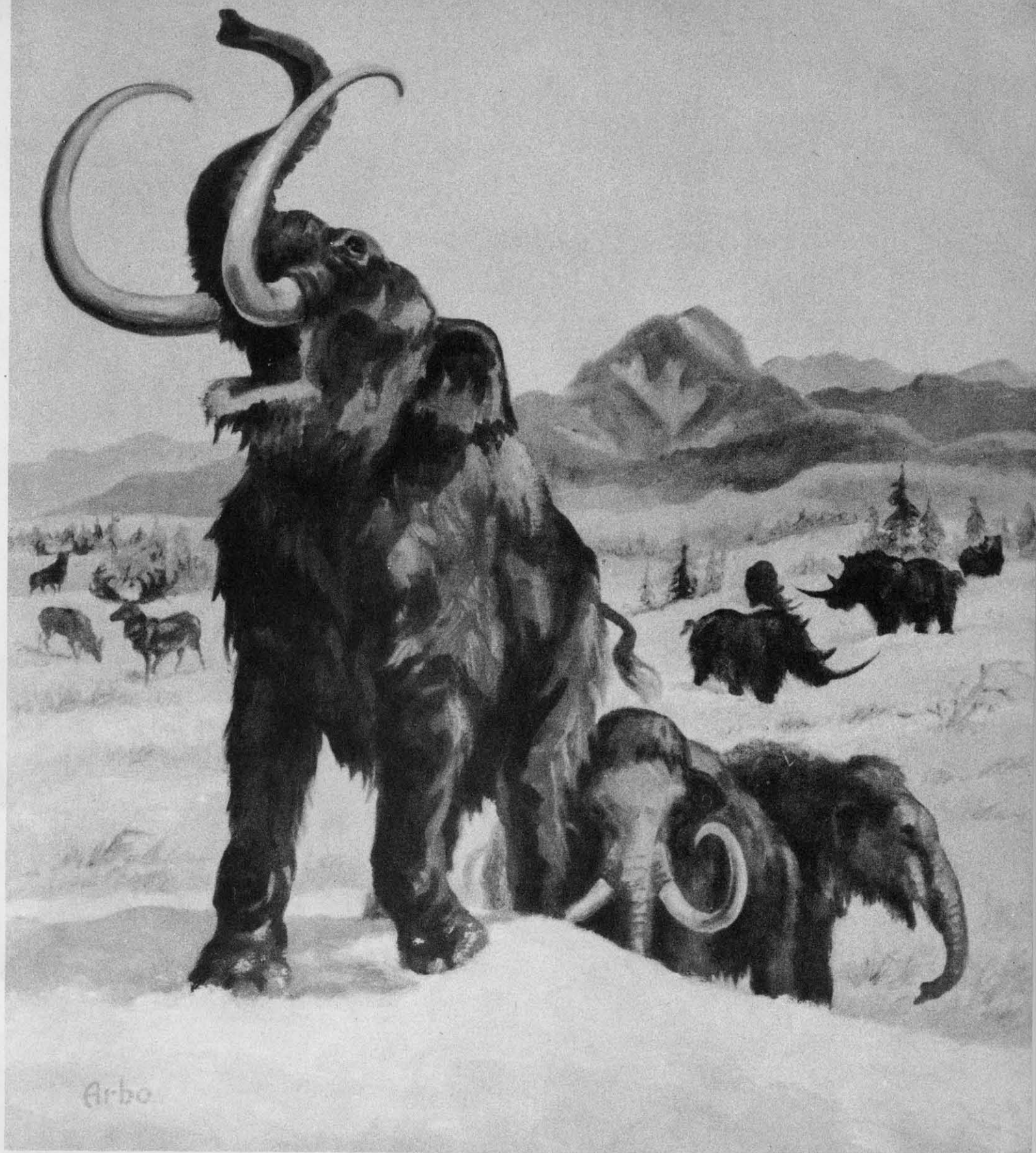
know it today, omitting, of course, those species which man has brought in from other regions. By the late Pleistocene the effect of intense competition to secure food and the constantly changing climatic conditions caused the extermination of many species, and with the entry of man into North America in more recent times he probably found the world very much as we know it.

Nature today is changing just as it has since the world began, and it probably will continue changing as long as the world exists. Our span of life, of course, is too small for us to realize the changes, and it is only by perspective, when we are thousands of millions of years removed, that these tremendous changes, sometimes lasting throughout many centuries, become noticeable. But our earthquakes, volcanic eruptions and other cataclysms of nature prove that the earth is far from stable.

If we could see ahead into the future as well as we can into the past, there is no doubt that we would be surprised indeed at the changes in the world a few millions of years hence. Is the domination of man on the wane? Will he too disappear as did the early dinosaurs? Who will be the next rulers of the earth? The questions are pure speculation. There is no answer.

The Dinoceras shown at the left are early mammals of the race known as amphypods. These creatures were far from beautiful, possessing a multiplicity of horns and two long, curving tusks. They were in the main herbivorous and decidedly dull witted. In the foreground at the right a herd of Hyopotamus is grazing. Small in size, they are primitive ancestors to our present day ruminants. Above them are a herd of Palaeomastodons. These creatures are the ancestors of the elephant and their lower jaw had already lengthened to form a support for the trunk which probably had prehensile power. Considering their time, they possessed a high degree of intelligence.





In the mid Eocene times an interesting quadruped was developing in Africa. These animals, only three feet high, had a neck long enough to permit their heads reaching to the ground. Their faces were sloping unlike our present existing elephants. Already the bones of the skull were falling into position for the development of the long trunk. From this animal developed the great Hairy Mammoth, the largest mammal that ever roamed the earth. Great herds of these creatures wandered over the tundras and ice fields of North America and Europe, and their huge tusks of ivory have been found piled so high and in such quantities that "fossil ivory" has become a standard item of commerce. The mammoth was a very recent inhabitant of the earth, and he disappeared probably in the late Pleistocene, why nobody knows.

Another interesting animal also inhabiting the colder parts of North America and Europe was the Woolly Rhinoceros, an ancestor of our better known African Rhinoceros, who possessed a heavy, shaggy coat of fur to protect him from the cold of the glacial winter. The early Rhinoceros was possessed of a very small horn, but through the ages this has developed and increased in size reaching its maximum in the "Titan Otherium," who lived in the Oligocene.

