

DRAWN BY CHARLES KNIGHT.

BY PERMISSION OF THE AMERICAN MUSEUM OF NATURAL HISTORY.

THE SEMI-AQUATIC PATRIOFELIS OF THE BRIDGER LAKE.
From a mounted skeleton in the museum.

PREHISTORIC QUADRUPEDS OF THE ROCKIES.

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WITH ILLUSTRATIONS BY CHARLES KNIGHT.

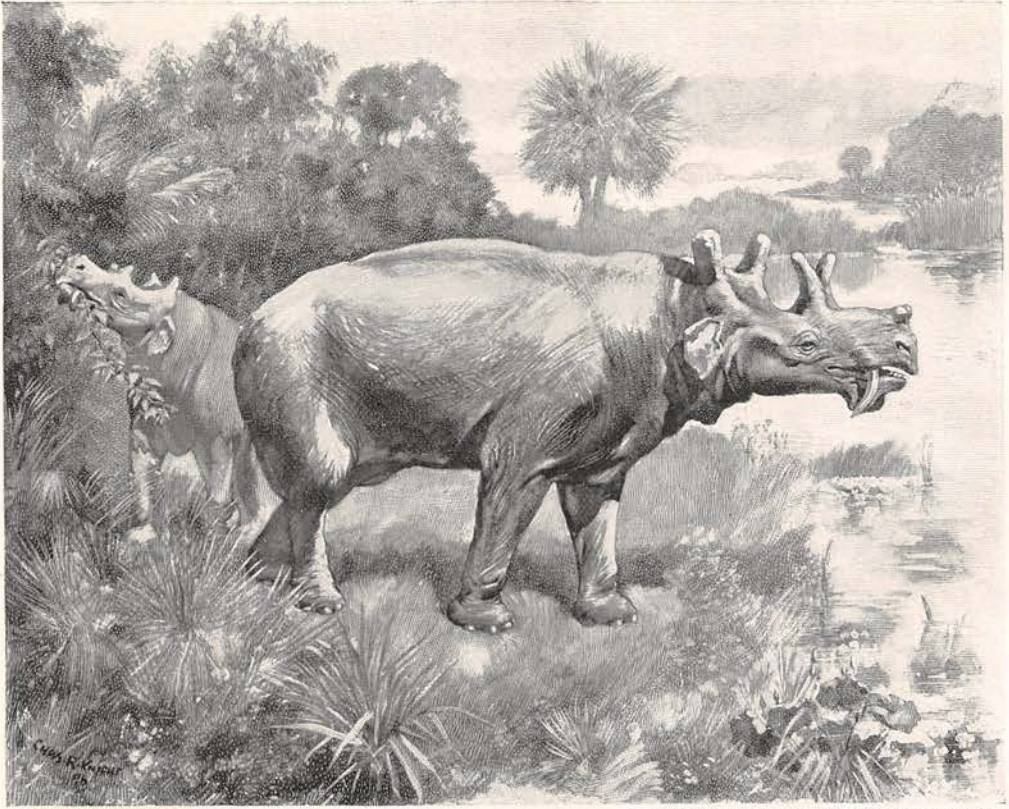
. . . And reconstructed there
From those same bones an animal
That was extremely rare.—BRET HARTE.

IN the American Museum of Natural History, and in the office of *THE CENTURY*, the writer has been exhorted somewhat as follows: «We appreciate all that is said of life in the great West a million or so years ago, and understand your enthusiasm; but will you not tell us about these animals in every-day language, avoiding *Loxolophodon*, *Titanotherium*, and other polysyllabled words, and calling them by their familiar names?»

¹ Several months have been given by Mr. Knight to the water-colors from which these pictures have been made, under the direction of the writer and Dr. Wortman of the American Museum of Natural History, Central Park, New York City. They are designed to give

Full of this well-meant advice, we look over the nine ancient beasts which have been so cleverly pictured by Charles Knight¹ under our direction, and observe that death has played havoc in their noble families. Only one has survived the wrecks of time: the four-toed horse, by far the smallest of the nine. Two others have been dead, say, a million years each, about three miles of rock lying vertically over their graves; but happily

an idea of the living forms of the remarkable extinct animals which are being collected for the museum, to be exhibited to the public in October. The water-colors are a gift to the museum from Mr. J. Pierpont Morgan.



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THE GREAT FOUR-HORNED UINTATHERE OF THE BRIDGER REGION, SOUTHERN WYOMING AND UTAH.

From a skull and skeleton in the museum.

for the reader, a distant strain of rhinoceros blood coursed in their veins, and we may speak of one as the aquatic or «swimming rhinoceros» (Metamynodon), and of the other as the cursorial or «running rhinoceros» (Hyracodon). A fourth animal, the Elotherie, might be described as the «giant two-toed pig»—if the reader will remember that the animal is emphatically not a pig. Here the possibilities of familiarity come to a sudden stop, for the remaining brutes are absolutely without the most remote living kinship, and the use of such terms as elephant, wolf, deer, or others which may be suggested by the illustrations, would violate one of the first canons of popular science—namely, never to seek clearness at the expense of truth. So we must Anglicize the Greek terms, which are, fortunately, euphonious and intelligible, and recognize the Uintathere (Uintah beast) as the great quadruped whose bones are found buried about the base of the Uintah Mountains of southern Wyoming, and the Titanotherie (giant beast) as the largest inhabitant of the great lakes east of the Rockies.

Before describing the animals themselves,

we may stop to note what our present knowledge of them has cost in human skill and endurance. Every one of these pictures is drawn from a complete skeleton hewn out of the solid rock, and each of these skeletons represents years and years of arduous exploration in which Wortman, Hatcher, Peterson, and others sent out by the American Museum, by Princeton, or by Yale, have become famous. Our party found the Titanotherie in a broiling alkali cañon of South Dakota. Its head was protruding from a hard sandstone cliff, and the chest, limbs, and trunk were chiseled out by the men under a rude shelter which lowered the noon temperature to 106°. They were encouraged to think that the whole beast had been mired in a standing position. This was probably the case originally but suddenly they came across a fault: it appeared that the hind limbs had been swept away; and it required two years' more searching before bones of an animal of a corresponding size were secured. Every other skeleton has its own story of determination, disappointment, and surprise.

The old lake-basins, once on sea-level, and

enriched by the moist, balmy winds of the Pacific, are now elevated from four to five thousand feet. The only redeeming feature of their present aspect of absolute barrenness is that the absence of vegetation leaves the old graves and burying-grounds bare. Fossil bones and skeletons are not plentiful—far from it; but a trained eye sees a great distance along the bare gullies, cliffs, and cañons, and your daily scramble of fifteen to twenty miles enables you to prospect over a vast stretch. You are off in the morning, stiffened by a frosty night. You know by sad experience that the ice in the basins does not promise a cool day. Your backbone is still freezing while the sun begins to broil and blister your skin, and you are the living embodiment of the famous dessert served by the Japanese—a hot crust without, an ice within. Your trail begins on the upland, which may be the actual level of the old lake-bottom; and as if walking through a graveyard, you never look for bones until the land breaks away by erosion. When you reach the edge of this upland, you look off into a sea of rock, sometimes wild beyond

description, and you plunge down the slope to a certain level. Then you follow this level round and round and in and out. Here you are on a seam which bears fossils. Above and below it are other similar fossiliferous seams, and between them are barren seams where you will not find a bone if you search till doomsday. This level, perhaps, represents the delta of a great mountain river which swept the animals out with coarse sand, pebbles, and debris. Sometimes you walk miles and miles, up and down, day after day, and see nothing but common turtle bones, which are so deceptive and tempting at a distance that the fossil-hunter profanely kicks them aside. Turtles are found everywhere because they swam out, basked in the sunshine of the mid-lakes, and occasionally sank to the bottom, while the carcasses of land animals were buried in the deltas or nearer shore. In such a fossil-barren land the heat seems twice as torrid, on the buttes your muscles and back ache doubly, your tongue lies parched from the last gulp of alkali water, your soul abhors a fossil, and longs for the green shade of the East, and the watermelon,



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THE LARGEST CARNIVORE, MESONYX, OF THE UTAH LAKE, NORTHERN UTAH.

From a skull in the museum and a skeleton in the Princeton Museum.

when, all of a sudden, a little projecting bone strikes your wearied eye. You fall on your knees, and breathe gently on the loose sand; a little scraping, and you see the signs of a skull—perhaps of some missing link. The thrill of discovery spreads like an elixir through your frame, and two or three hours later, after carefully cutting out the prize, you walk vigorously back to camp, every inch a man. Thus fossil-hunting is a life of vicis-

and turtles, precisely like those of to-day, pushed their way among the rushes, ferns, and palmettos. In spring the Judas-tree and the acacia bloomed; in the autumn the persimmon sweetened. Canes and palms gave shade along the alkali levels, while upon the hills the birch, chestnut, ash, linden, hickory, and sumac passed their vernal and autumnal phases of color. A Louisianian from the Teche country would feel quite at home in



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THE FOUR-TOED HORSE, FOUR HANDS HIGH, FOUND IN THE WASATCH LAKE OF THE BIG HORN MOUNTAINS, NORTHERN WYOMING.

From a mounted skeleton in the museum.

situdes and emotions. The fossil-hunter is predestined to his work, like the sportsman. He returns East in the autumn, vowing he will never go back to the Bad Lands; but as the favorable months of spring come round he becomes more and more restless until he is off.

The country that is as hot as Hades, watered by stagnant alkali pools, is almost invariably the richest in fossils. Here, in fact, as you find the greatest variety and number of bones, you enjoy the most delightful flights of the scientific imagination; when parched and burned, you conjure before you the glories of these ancient lakes. About their shores alligators

such a vision of one or two million years back, so far as his eye fell only upon the alligator and the garpike, and upon equally conservative trees and plants, which have not changed from that day to this. The streams and bayous would seem familiar. The only landscape features strange to his eye would be the low ranges of hills, the embryonic Uintah and Rocky Mountains. We can imagine his repose beside a Bridger stream rudely disturbed by the spring of a huge, otter-like animal upon a half-grown alligator dozing upon the bank. This beast (destined to yield the first fragment of his jaw-bone some eons later to the veteran Joseph Leidy, and to be



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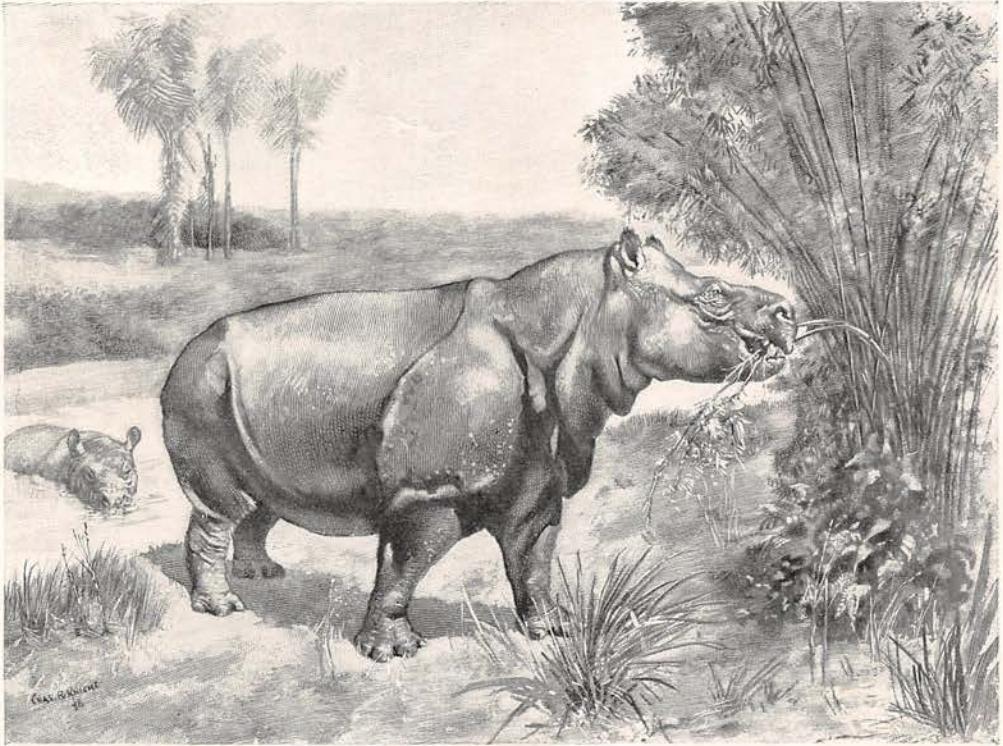
TITANOHERE FAMILY—BULL, COW, AND CALF—OF THE SOUTH DAKOTA LAKE BASIN.

From a mounted skeleton and skulls in the museum.

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termed *Patriofelis*) shows broad feet with spreading toes, probably webbed between, as best shown in his mate snarling upon the bank. A short forehead, a few sharp teeth like those of the cat, a very long body, and an extremely powerful tail indicate that he is a swimmer, and could follow the alligator into the water if necessary. The animal's chief distinction, however, is its extremely small brain: for, while his whole frame nearly equals

our imagination from the point where we witnessed the capture of the alligator downstream, as the sluggish river broadens into the Bridger Lake, with the low Uintah hills in the distance. Coming round a turn, we observe a huge quadruped with a very long, narrow skull surmounted by four horns—a larger pair just over the ears, and a smaller pair just above the eyes; the snout terminates in two knobs; the lower jaw is very shallow



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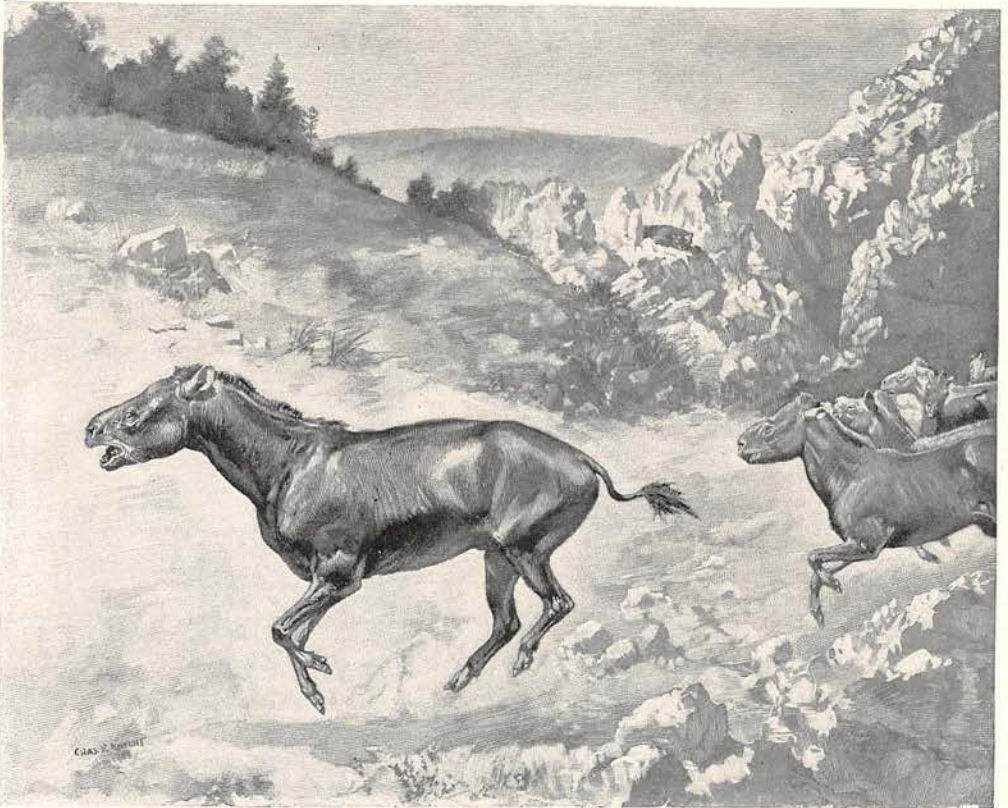
AQUATIC RHINOCEROS, *METAMYDON*, OF THE SOUTH DAKOTA LAKE BASIN.

From a mounted skeleton in the museum.

that of a tiger, his brain is little larger than that of a terrier dog, the impression of a well-rounded head being entirely due to the large masses of jaw-muscles between the ears. This lack of brain-power was apparently a costly deficit in the *Patriofelis* family income; for fine as these animals were in frame and muscular development, they appear to have gone under in the struggle for existence.

As the archæologist among the ruins of Nineveh measures his progress by his ability to restore the ancient palaces and temples, dress, habits, and conversation of the Ninevites, so the paleontologist strives to place himself back upon the borders of these old lakes; bones and fossil plants are his cuneiform characters. Let us, therefore, follow

behind, but dips in front into two deep flanges which seem to protect the two great upper tusks. Coming up behind this brute is his female companion, distinguished by shorter horns and smaller tusks. She is using her tusks to tear down a branch, when, with a rapid side motion of the head, she rips off the leaves into the broad gape of the mouth. The body is longer, but otherwise like that of an elephant, the limbs and feet being heavy and clumsy. The eye is small and inexpressive, and below the hollow of the space back of it lies relatively the smallest brain known in any warm-blooded animal. The body weighs perhaps two tons, while the brain is about the size of that of a dog, and weighs less than a pound. The ratio of brain weight to body



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CURSORIAL RHINOCEROS, HYRACODON, OF THE SOUTH DAKOTA LAKE BASIN.

From a skeleton in the Princeton Museum.

weight is therefore about $\frac{1}{40000}$,¹ and this gigantic Uintathere² is heavily handicapped by his stupidity, and by the very small size of his grinding-teeth. At all events, he is the last of a long-race of animals which arose back in the reptilian period.

The next animal one sees is up among a grove of young sequoias, standing over the skull of a Uintathere. He has a very long, low body, somewhat like that of the Tasmanian wolf, terminating in a powerful tail, short limbs, and flattened nails (hence the name Mesonyx, or half-claw, given him by Cope). The wide gape of his mouth exposes a full set of very much blunted teeth, which prove that this huge flesh-eater could himself hardly have killed the Uintathere, but has driven away some other beast from the carcass. Perhaps, like the bear, he had a taste for all kinds of food, or, as Cope has suggested, by his fondness for terrapin he may have blunted his teeth in breaking through the

soft-shelled turtles (Trionyx) which are so abundant in this lake. This is another animal with a very small brain, and is also the very last of his race.

The modern game exterminator, who shoots everything he sees, and robs Nature of what she has been ages in evolving, may claim that Nature herself sets the example of destruction when he learns that the Uintathere, the Patriofelis, and the Mesonyx were doomed, and never fed or browsed upon the borders of the great Nebraska-Dakota Lake which succeeded the Wyoming-Utah, or Bridger, Lakes which we have been exploring. But the case is really not parallel, for, whereas the wanton hunter leaves no life in his trail, Nature always replaces one form of life by another.

If we leave the lake shore, and pass into the drier upland, we discover the clever little four-toed horse, swift, alert, intelligent. He is, to use the modern measure, only four hands, or sixteen inches, high, so he would not reach the knee of the Uintathere, and could be devoured at one sitting by the Patriofelis. His limbs are as slender as pencils.

¹ In the fishes this ratio is the lowest, $\frac{1}{30000}$. In man it is the highest, $\frac{1}{35}$.

² *Uintatherium cornutum*, Cope. The animal was first named by Leidy.

His large eyes are much farther forward than in the horse. He could readily hide among the taller stalks, and it is possible that he had the beginning of protective stripes imitating reed shadows upon his neck and mane. In his hair and coloring, however, we pass into pure conjecture. His well-worn chisel-shaped front teeth indicate that he was already a cropper or browser, and the evident secret of his triumphant persistence over his ponderous

about the subsidence of his Atlantic coastline. If he had explored to the north he would have found the dry bottom of the old Wasatch Lake there. But this prophetic warning of the approaching drainage of the Bridger Lake would have given him little uneasiness, because the recession of the waters was so inconceivably slow. Yet the mountains were irresistibly rising in the north, and tilting this beautiful Bridger sheet toward the



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THE SIX-HORNED PROTOCERAS OF THE ANCIENT BLACK HILLS, SOUTH DAKOTA LAKE.

From a skeleton in the Princeton Museum.

contemporaries is that he learned to browse just about the time that grasses began to appear. He was the animal for the times.

The Louisianian would probably not have been more disturbed by earth tremors if he had taken up his residence in Wyoming 2,000,000 B. C., than our New Jerseyman is

south into the Uintah Lake of Utah. As this lake was also drained off by the Colorado, and converted into a river-basin, wherein no fossil records are kept, a blank chapter would have occurred in our history but for a decree of Nature which should make every paleontologist grateful to the Creator. By this



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ELOTHERE, OR GIANT PIG, OF THE SOUTH DAKOTA LAKE.

Drawn from a skeleton in the Princeton Museum.

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decree, while the Uintah Lake to the west of the Rockies was still drying, the great lakes along the eastern slopes of the Rockies began to form as a new burial ground upon a grand scale from Canada to the Gulf.

This newer cemetery of vast age was first made known to us, in 1847, by the discovery of part of the lower jaw of an animal akin to the attractive family group represented at noonday rest upon page 709. Thirty years of almost continuous exploration have brought us to the point where we can restore these beasts with some degree of confidence.

The Titanothera, although the reigning plutocrat of the South Dakota Lake, as we may call it, was no feral parvenu or upstart. He boasted a family tree branching back to a small tribe which lived in a modest way beside the Wasatch Lake some half million years before. These small but hardy ancestors had seen the Uintatheres swell in size, take on horns, and disappear. Apparently no record of this fact was preserved, for hardly had the Uintatheres gone to earth when the Titanothera family, unmindful of the fate attending horns and bulk, began to develop horns which sprouted like humps over the eyes, as may be seen in the little calf. For a while the males and females had humps of the same moderate size, but as the premium upon horns rose, the old bulls made great capital of them, fighting each other, and butting the females who would not return their courtship—a fact attested by broken ribs. Finally these horns attained a prodigious size in the bulls, branching off from the very end of the snout, unlike anything in existing nature. In the mean time this «Titan-beast,» as Leidy well named him, acquired a great hump upon his back nearly ten feet above the ground, while he stretched out to a length of fourteen feet, and expanded to a weight of two tons. He increased in number also, as one sees in the scores of his petrified bones. This prosperity was, however, fatal, for in the stratum above not a trace of this family remains. It is difficult to assign the cause of this sudden exit; it was certainly not lack of brains. Vast floods, extensive droughts, cold waves, epidemics, suggest themselves as possible causes, but change of flora seems the more probable. The Titanothera grinding-tooth was not of a type which could adapt itself even to a slight change of vegetation, and this animal died out at the very climax of his greatness.

He made way for the interregnum of the swimming or aquatic rhinoceros (*Metamynodon*), which appears in numbers in the over-

lying strata. It was when we undertook to place the muscles, hide, and features upon this strange beast in this painting that we discovered that he was probably a water-lover. The first suggestion came when we located the eyes, and recognized that they were placed very high upon the face, apparently to keep them out of water, as in the hippopotamus. Then the high nostrils opening upward, the recurved tusks adapted to the uprooting of plants along the river banks, the four-toed, spreading front feet, entirely unlike those of the modern rhinoceros, and effective in swimming, all seemed to confirm the aquatic theory. The forefathers of this brute also roamed or swam along the Bridger Lake, while his descendants went abroad, and the family passed its declining years in France not far from the site of Paris. We should remember, in this connection, that a journey to Europe in those days was not made across the Atlantic, but overland by way of the Isthmus of Bering Strait, and thence across Asia.

As remarked at the beginning, this *Metamynodon* was not a bona-fide rhinoceros, but a side branch from the same stock. The thoroughbred rhinoceros was, however, abundant. In fact, after the Titanothera had been gathered to his fathers, you or I would not have felt nearly so strange in South Dakota as our Louisiana friend did along the Bridger Lake. Most of the queer archaic beasts had given up the struggle. We would have recognized the rhinoceroses immediately; also the tapirs, the llamas, or ancestral camels, fierce cats of the size of the puma, the dogs, and the monkeys. The little four-toed horses would have perhaps puzzled us for a moment because of their small size, short heads and limbs, but several other quadrupeds would have made us feel that we had given too much attention to the classics, and that our own zoölogical education had somehow been deficient.

For instance, leaving the swimming rhinoceros at the lake border, and the true rhinoceros in the grasses and shrubbery of the lower meadows, and climbing up among the lower Black Hills, we might have seen a large herd of Hyracodons, or cursorial rhinoceroses, galloping by, frightened by a crouching ancestor of the saber-tooth tiger. As Scott has demonstrated, these light-limbed animals were horse-like to a surprising degree in the shoulders, haunches, and limbs. So we feel that we are not far from the truth in giving them the awkward gallop of the instantaneously photographed horse. They were, however, in no real sense horses,—ex-

cept in this wonderful mimicry of habit,—for the teeth prove them to be rhinoceroses, small, light, and swift-footed, in extreme contrast of structure with the swimming type.

Still farther up among the hills we startle a pair of animals (Protoceras) which are beautifully graceful, except in the head and snout. The buck (for they are very remotely related to the deer family) proudly displays a profusion of bony horns, a pair between the ears, a much smaller pair between the eyes, and two very prominent bony plates behind the nostrils, below which spring two sharp tusks, as in the musk-deer. The doe lacks the tusks and all the horns. This much is certain. Here is a favorable chance to take the reader into our confidence, and admit that the form of the snout, the shape of the ears, the coloring of the back and belly, the rings of dark hair about the neck and ankles, are in the highest degree uncertain. In this case they are all studied from the antelope. The rocks preserve only bones and teeth, the position of the eyes, ears, nose, mouth, the strength and position of the muscles. All else in such restoration is pure conjecture, in which we reason and depict only by analogy.

So with our giant pig, or Elothere, which we might suddenly confront when returning after our mountain climb to the river and lake-level. His bristles, his great shaggy mane, the dewlaps swinging from the great bony knobs under his chin and jaws—all these are inferences from the remote kinship

of this beast to the pig family which one must also take with a mental reservation.

There is no doubt that the Elothere was a pig of the first rank, and thoroughly cosmopolitan in his range. While the Titanotheres were extant he maintained the humble size of the tapir, but when these rivals and the swimming rhinoceroses passed away the reign of the giant hogs began. They acquired skulls nearly four feet long, armed with huge cheek bones and under jaw-plates, powerful upper limbs, and narrow, stilted feet, differing from those of the pig in the absence of dew-claws; the shoulders rose into a hump, but the chest was shallow and feeble. The open mouth displayed a row of pointed front teeth used in rooting and grubbing, as shown in the animal on the bank.

Thus we conclude a glimpse of two phases of ancient life in the Western lakes, two brief episodes out of hundreds in the long history of the great West.

All these monsters had their day, while the sun shone, the birds warbled, the insects hummed over thousands of miles of water and luxuriant sub-tropical bloom. Meanwhile the Western continent slowly rose, the Sierra shut off more and more of the sweet influences of the Pacific, and before the arrival of man this splendid assemblage of life was finally replaced by the hardy animals of the hills, the small and colorless denizens of the desert, and the ruminants of the plains. The complete restoration of the glories of that earlier era is the dream and ambition of the fossil-hunter.

Henry Fairfield Osborn.

IN ABSENCE.

AS one who turns from waves upon the shore
To dream a distant ocean in the sky,
Thine absent presence sways my spirit more
Than all the human voices thronging nigh.

How visible, yet how removed, are these
Strong hands I touch, these kisses on my face,
When sunset, smiling wistful through the trees,
Again enslaves me to thy vanished grace!

My thoughts outrun the senses slow, to share
In some unfettered realm our old delight,
As if a vibrant chord had thrilled the air
And loosed wide wings a-quivering for flight.

I breathe thy hidden fragrance, feel thee near,
Disdainful of each barrier's control,
Till all my world becomes thy symbol, dear,
And parting but a gateway of the soul.

Martha Gilbert Dickinson.