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THE NATIONAL GEOGRAPHIC MAGAZINE

CONTENTS

PAGE

THE WYOMING FOSSIL FIELDS EXPEDITION OF JULY, 1899
With illustrations........ WILBUR C. KNIGHT 449

GOLD IN THE PHILIPPINES........ F. F. HILDER 465

THE TEACHING OF PHYSICAL GEOGRAPHY IN ELEMENTARY SCHOOLS........ RICHARD E. DODGE 470

GEOGRAPHY AT THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE........ 475

DECISIONS OF THE U. S. BOARD ON GEOGRAPHIC NAMES........ 478

SOME SIGNIFICANT FACTS CONCERNING THE FOREIGN TRADE OF GREAT BRITAIN........ 480

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THE
NATIONAL GEOGRAPHIC MAGAZINE

VOL. XI DECEMBER, 1900 No. 12

THE WYOMING FOSSIL FIELDS EXPEDITION OF JULY, 1899

By WILBUR C. KNIGHT,

Professor of Mining and Geology in the University of Wyoming

There has recently been a renewal of activity in collecting fossil remains in Wyoming. For a number of years, during the '70s and '80s, Wyoming was the most attractive field in the world for the student of vertebrate remains, and the collections then made include some of the rarest and most valuable known to science. From 1890 to 1895 little was done, but a revival occurred in 1897. Owing to the success of the American Museum of Natural History and the University of Wyoming in collecting remains of dinosaurs, Mr E. L. Lomax, general passenger and ticket agent of the Union Pacific Railroad Company, concluded that he could render a valuable service to the scientific world by organizing an expedition on a large scale for the purpose of collecting fossils and studying geology.

Mr Lomax began with the publication of an illustrated pamphlet, which gave in a brief way some information pertaining to the fossil fields and the restoration of some of the important animals that, long prior to the existence of man, inhabited what is now Wyoming. This pamphlet, together with an invitation to join the expedition, was sent in the spring of 1899 to every university, college, and museum of importance in the United States. The invitation included free transportation from Chicago to Laramie, Wyoming, and return, and allowed each institution one professor and one or two assistants. Unfortunately many scientific men had already planned their summer's work and were consequently unable to accept the invitation. Nearly one hundred men, however, availed themselves of this opportunity for study in the Rocky Mountains, and arrived at Laramie, as designated, on July 19.

Upon their arrival the visitors were conducted to the university, which President Smiley had thrown open as headquarters during their stay in Laramie. At noon luncheon was served on the university campus by the camp cooks, and many members of the party had their first experience of camp life. In the afternoon of the same day a permanent organization was effected, and, besides the usual officers, referees were elected for the leading branches of geology, paleontology, botany, zoölogy, and photography.

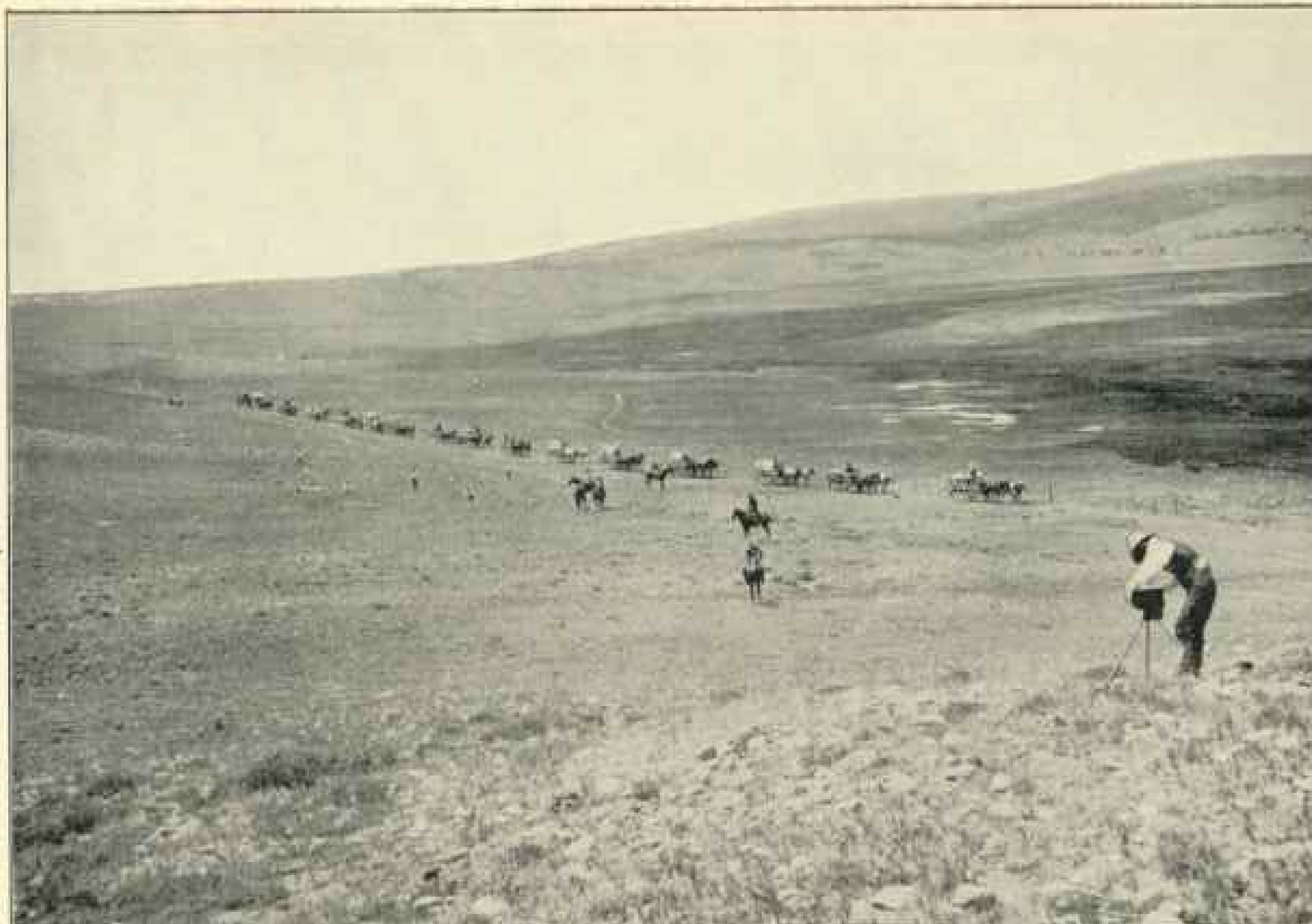
An unfortunate mistake had been made in connection with the shipping of the tents for the expedition, which were to have been ready for occupancy on the evening of the 19th. Luckily, however, the bedding was at hand, and the weary men were not loath to make up their beds and roll into them, taking their choice between the floor of the university and the campus.

The perfecting of arrangements for an expedition on so large a scale was no easy task, and it was late in the afternoon of the 20th before it was accomplished. That evening an informal reception was tendered the visitors in the university auditorium.

The following morning all were astir very early. Each man was busy selecting such things as he deemed necessary for the journey. The wagons arrived at nine o'clock, and by ten they were nearly all loaded and the leading team had started, heading west and north, across the Laramie Plains. Thus was inaugurated the largest expedition of the kind of which there is any record.

The men composing the party represented almost every State from the Atlantic to the Pacific and from Minnesota to Texas. Some of them had never before slept in a camp overnight, and were entirely unaccustomed to rough camp cooking; many had had no experience whatever of camp life of any sort. The journey from one end to the other, however, was marked by unselfishness, justice, and kindness, and the proverbial "kicker" was consequently unheard of.

It may be of some interest to know how the cooking was done and how the meals were served. The organization was divided into messes of ten men each, and with every mess there were three wagons—two for transporting the members of the party and one for conveying the food, beds, and tents. With each mess there were two teamsters and a cook, so that each formed in reality an independent party. The mess wagons were provided with the western "grub boxes," such as have been used on the plains and in the mountains for many years. The cooking was done on open fires and the baking in a Dutch oven



ON THE MARCH AT COOPER CREEK CROSSING

DIGGING FOSSILS — DUTTON CREEK

a shallow iron pot with a tight-fitting lid, that can be placed upon coals and also covered with them. The meals were served in "cowboy" style—*i. e.*, the whole of the food being cooked, it was arranged about the fire to keep warm, and each man, when the meal was called, took his plate, cup, etc., and helped himself, usually sitting on the ground to eat.

Not all who had accepted the invitation of the Union Pacific Railroad Company joined the main expedition. Representatives from the Kansas University, the Carnegie Museum, and the Field Columbian Museum went immediately to the dinosaur fields. The Northwestern University and William Jewell College parties hired teams and drivers and did their own cooking and camp work, while the Wheaton College party purchased a team and wagon and did its own driving and camp work. The three parties last mentioned were, however, with the main expedition most of the time for 20 days. The latter was composed of 86 men, but when the three semi-independent parties were present there was a total of 102 men.

The first day's march was to have been 20 miles, but through a misunderstanding on the part of the leading team it was extended to 25 miles, when camp was pitched near an alkali pond. It was very late; tents were put up with some difficulty, and supper was eaten after dark. It was an unpleasant beginning, and many felt it keenly.

On the following morning the head cook did not have to call "roll out" at 5.30, as he did in the days that followed. All were up by sunrise, and some even earlier, especially one, who, owning a Winchester, went to the pond before daybreak and, shooting at some ducks, sent a bullet singing over the camp. At breakfast there were many amusing discussions, which were continually interrupted by such questions as, "How did you sleep?" "Was your bed soft?" and other interrogatories relating to the new experience. Those who are unaccustomed to sleeping in tents or in the open air seldom sleep at all the first night out.

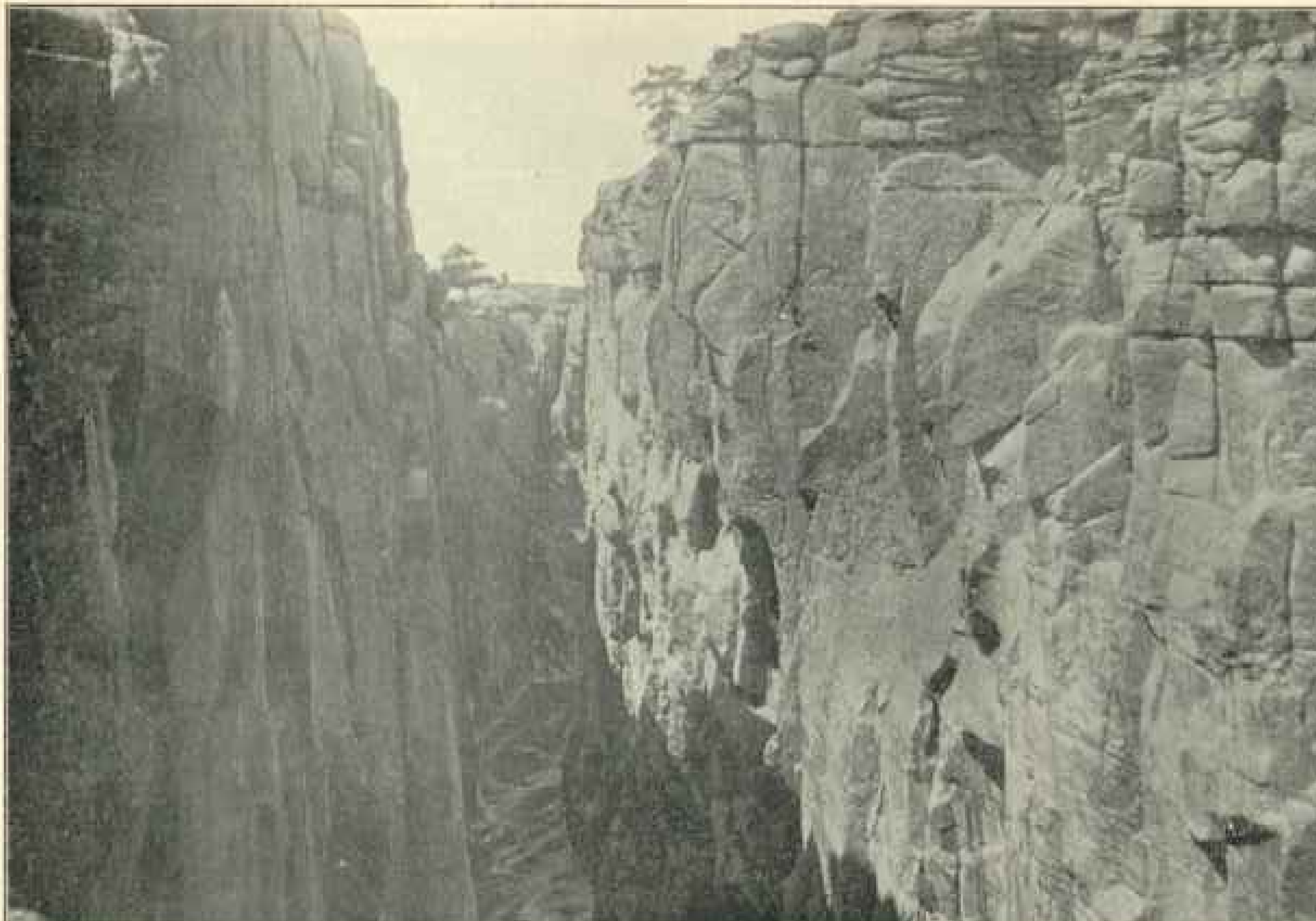
The second day's march was a very short one, and before noon the wagon train was winding down the old Government trail to Cooper Creek Crossing, where Camp No. 2 was established. Here there were shade, an abundance of good water, and, best of all, some fossiliferous bands of sandstone. Luncheon was served, and every man in camp armed himself with pick, ax, hammer, shovel, and sack, and hurried across the valley to a bluff less than half a mile away, where invertebrate fossils were to be found in abundance. In a short time the face of the bluff was nearly covered with collectors, and chips and fragments of stone were flying in all directions, to such an extent, indeed, that it was uncomfortable and almost unsafe to remain in the vicinity. The men labored long and hard, and, while most of them returned to supper, some became so enthusiastic as to forget their meals, until darkness compelled their return to camp. That night the camp fires along Cooper Creek burned brightly, and the stimulus gained by a successful afternoon's study and work engendered a feeling of mirth and jollity that broke forth in story-telling and college songs.

The next day being Sunday, camp was not moved. The wagons, however, were placed at the disposal of the members of the expedition, and many of them drove to the Medicine Bow Mountains, which were only five miles distant, and climbed to snow-line, played snow-ball, and wandered in the pine forest until they came in contact with an area of fallen timber, through which they did not wander to any extent. The sunshine and dry atmosphere had begun to tell on the noses and lips, and to some extent on the cheeks, of nearly all.

From Camp No. 2 the trail crossed Dutton Creek, passed some local coal-mines, and then followed down Rock Creek, where the topography reminds one more of an eastern valley than of a mountainous country. By the fifth day out the expedition had collected two tons of fossils, which were chiefly invertebrates and fossil leaves.

On the arrival of the expedition at Como Bluff, rendered famous by the work of the late Professor Marsh, enthusiasm was unbounded. It was from this locality that Yale University received its largest amount of dinosaur material. The bluff rises to a height of 200 to 300 feet, and parallels the Union Pacific Railroad for five or six miles, being south of the track, and nowhere over half a mile away. It is capped with conglomerate, and just below this band are the dinosaur beds of variegated marls and clays, plainly visible from passing trains. From these beds Professor Marsh secured his largest dinosaurs, which not only made him famous, but gave Wyoming the distinction of possessing geological graveyards containing fossil remains of the largest land animals that have ever inhabited the earth. The members of the expedition were successful in finding a great many dinosaur bones, and some opened quarries that gave promise of being very valuable. The time spent at this point, however, was so short that there was no opportunity to remove marls enough to investigate even partially the many finds.

FALLS IN THE GRAND CAÑON OF THE PLATTE



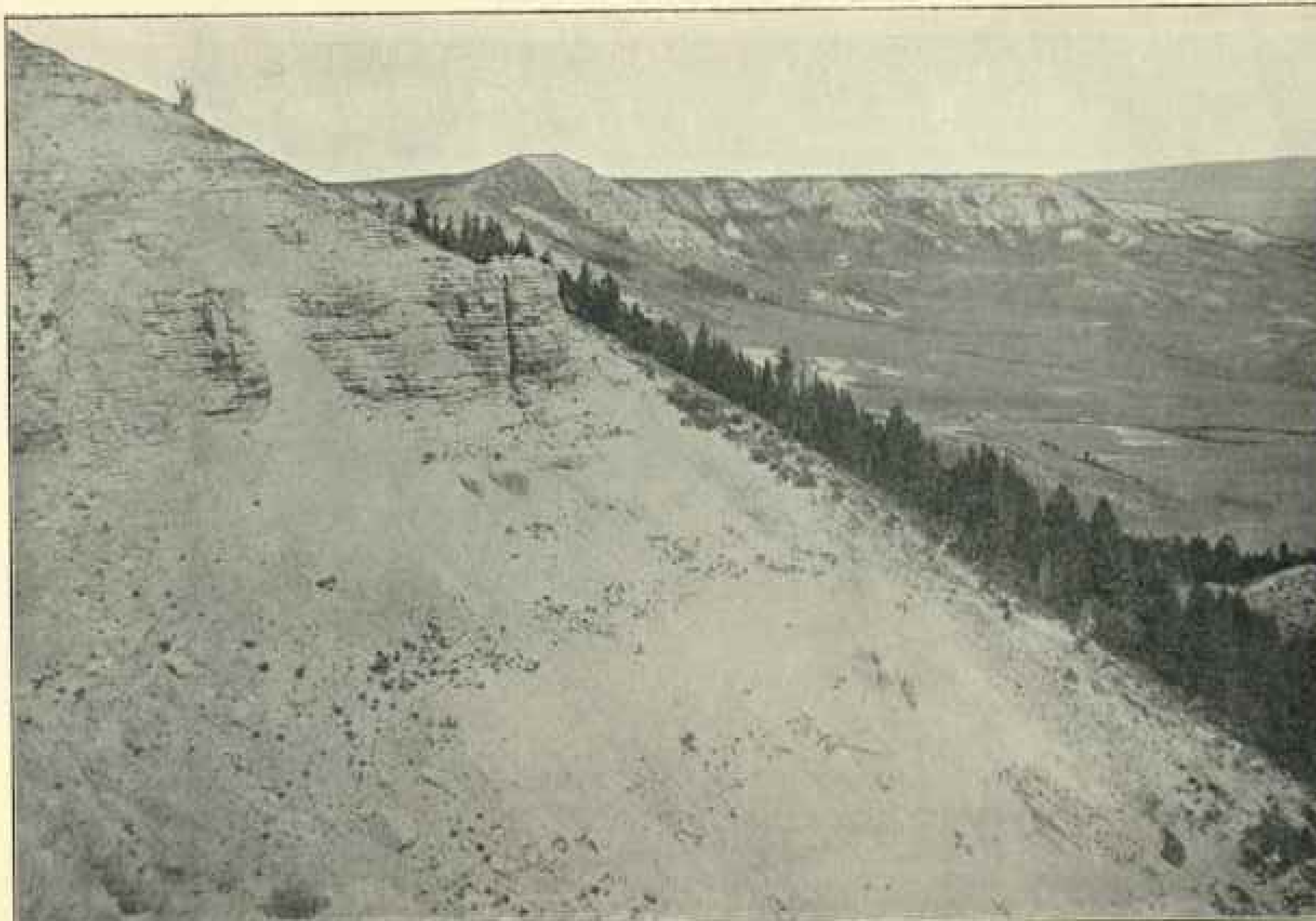
DRY CAÑON OF THE GRAND CAÑON OF THE PLATTE

Most of the explorers were by this time beginning to feel anxious lest the Cañon of the Platte, the objective point of the expedition, would not be reached within the time available. The field-work was therefore curtailed and a march was made that followed the railway to Medicine Bow Station, beyond which the Medicine Bow River and the Little Medicine River were forded, and after one camp the Freezeout Hills were reached, which is a new locality for dinosaur collecting. Here the geologist and paleontologist found unbounded opportunities. The various bands forming the great fold in the Freezeout Hills were all uncovered, so that it was possible to study the entire section in minutia. Here were also the quarries of the National Museum, the Field Columbian Museum, and the universities of Kansas, Minnesota, and Wyoming. This being a comparatively new field and the dinosaur beds being exposed for a distance of 10 miles on each side of the camp, dinosaur hunting was the order of the day. Long before sunset on this never-to-be-forgotten 29th of July, men were returning to camp from every direction loaded down with bones; others were seeking teams to haul their heavier loads to camp, and though they worked diligently, it was nearly 10 o'clock before the last load of fossils was brought in. The next day's work unearthed a still larger quantity, the entire shipment from this point amounting to several tons.

The next camps were made in Shirley Basin, on Dry Creek, and the following one on Cottonwood Creek, which is only two or three miles east of the Grand Cañon of the Platte, and is the nearest camping ground convenient for a large party. The cañon had been the principal topic of conversation for several days, and now that we were approaching it, anticipation was at its height, and arrangements were hurriedly perfected for an early morning start. Every man was up in good time, and it is needless to say that no cameras were left behind. After less than an hour's walk the gorge was reached, and the party scattered, each bent upon the discovery of more magnificent views than were found by his neighbor. On that day not less than 500 plates and films were exposed.

This magnificent cañon has never been described. It is hard to account for so perfect an example of a cañon having been passed by, alike by adventurer and scientist, when it is really the grandest piece of scenery to be found near the overland trail between Fort Laramie and Salt Lake. One of the famous camping grounds on this trail is not more than half a day's travel from the gorge, and many pioneers must have kindled their fires within the sound of its warring waters. Frémont was the only man to mention it in any of the early exploration reports, and there are reasons for believing that he never saw the cañon proper. It was this cañon that Frémont, with five men, tried to pass in a boat. Recently in a conversation with Mr Thomas Sun, a pioneer of Wyoming, the following fact was learned: Descoteaux, who was Mr Sun's adopted father, was one of the men selected by Frémont to accompany him on the supposed perilous boat trip through the Grand Cañon of the Platte. Mr Sun states that Descoteaux often told him about Frémont attempting to run the cañon in a boat, and being swamped in the Sweetwater, long before the cañon proper was reached. To one familiar with the country this story has much greater weight than the one told by Frémont, in which he claims that he abandoned his boat in the main cañon. The cañon is now impassable by boat, except perhaps in very high water, and up to the present time there is no authentic record of any one having passed through it. It is about eight miles in length, and extends from the mouth of the Sweetwater River north and east nearly to Hot Springs Cañon.

The country about varies from rolling uplands to hills, and the cañon sinks so suddenly in the rocks that a mile away one would not anticipate such a gorge but for the sound of its roaring waters. At the place where the Sweetwater enters the main cañon the country is granite, and it remains so for several miles below. One of the very interesting spots in the granite area is about three miles below the mouth of the Sweetwater. Here the walls of the cañon rise almost perpendicularly to a height of 500 feet. The channel below is less than 50 feet in width, and above it is so narrow that even a person unaccustomed to the use of his left hand could easily throw a stone left-handed across the chasm. This is truly a dark cañon, for in many places the sun never reaches the bottom. The river rushes through these walls of granite on edge, with a deafening roar. From the water's edge to a height of about 100 feet the walls of the cañon are water-carved into great pits and projections, and in the highest of these we found remains of flood-wood, proving that the depth at high water must have been at least 100 feet. Below, in the river's path, are natural dams, made by huge masses of granite that the frost has wedged off from the walls. These dams produce rapids and falls through which no boat could pass. From the very narrow gorge the cañon widens, only to narrow again and then to widen out still more



WEST SIDE OF BATES HOLE

BARLOW GATE — EAST WALL OF BATES HOLE

at the point where the sedimentary rocks appear. These rocks are made up of red, brown, pink, and light-colored bands, through which the cañon has been carved, and here one is doubly impressed by the remarkable coloring and the great walls of lime and sandstone, that are nearly 1,000 feet in vertical height. As the river enters the sedimentary rocks it gradually widens, and the stream, that was less than 50 feet in width when passing the narrows, broadens out to about 300 feet as it leaves the cañon. Throughout the entire length of the cañon there are only a few places on the eastern wall where one can descend to the water's edge, and these are all very dangerous and should not be attempted by those unaccustomed to dizzy heights.

By climbing over huge blocks of stone, through dense underbrush, and along narrow, projecting ledges, where one has to cling by his finger-ends for fear of falling a hundred feet or more, one can enter the mouth of the cañon and occasionally reach the water's edge as far south as the sedimentary rocks extend. Here the walls and the water meet, as they do in most of the granitic portions. There is good evidence that several thousand feet of sedimentary rocks have been removed from the granitic area, so this is only the remnant of a greater gorge, whose walls were thousands instead of hundreds of feet high. The Grand Cañon of the Platte is one of Wyoming's finest pieces of scenery—a gem that has been passed by and a place destined in the near future to be one of the famous resorts of the Rocky Mountains.

Everyone was reluctant to bid farewell to Camp No. 9, on Cottonwood Creek, but the journey had to be resumed, and from now on it was toward Laramie, the trail following the rim of Bates Hole to Deadman Gulch, thence skirting the foot of the Laramie Mountains eastward.

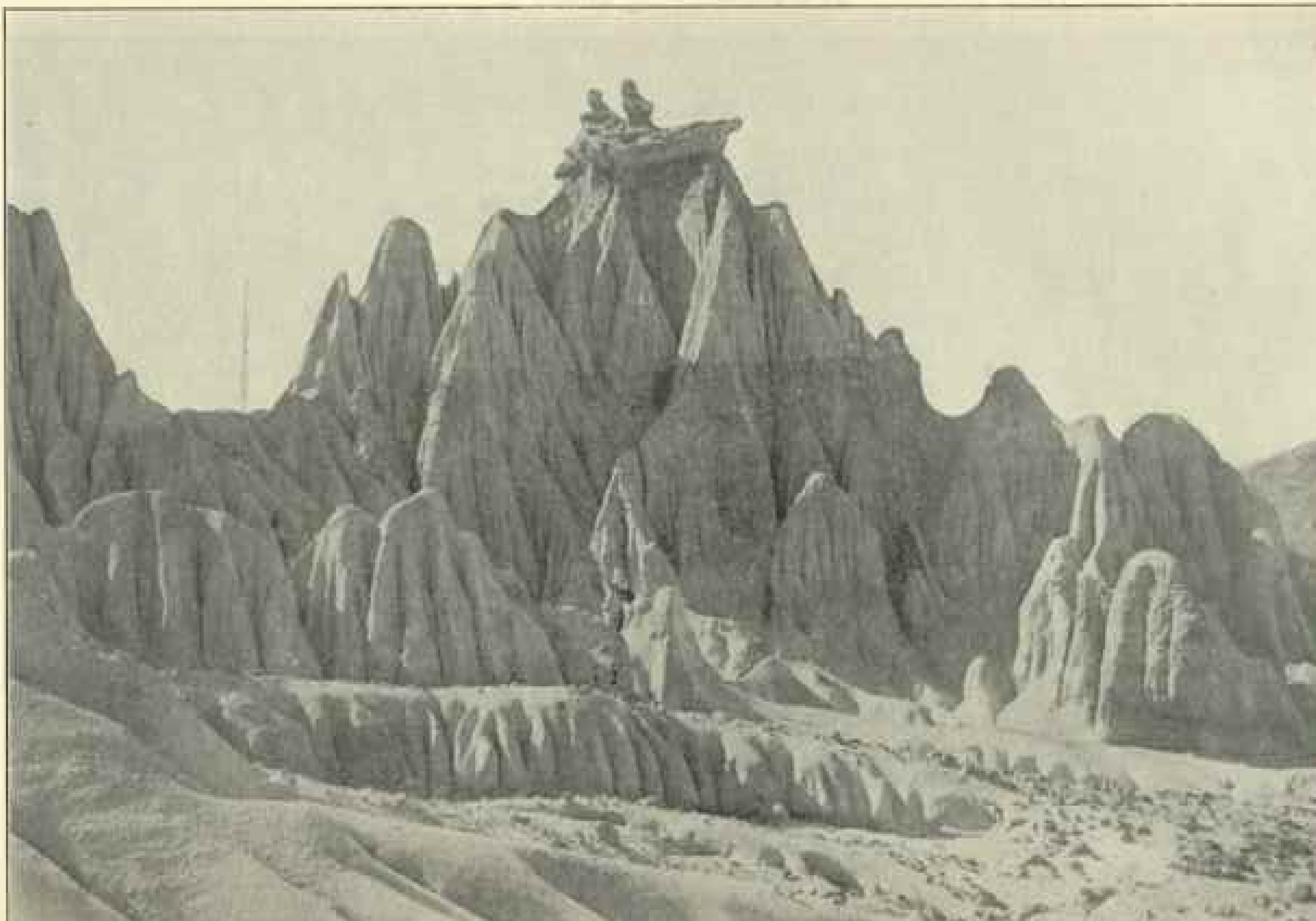
Bates Hole is another instance where a region brimful of geographic and geological interest has been almost entirely overlooked. "The Hole," as it is usually called, was named after a hunter and trapper who formerly had his home there. In reality, it is a great valley that has been eroded out of the soft tertiary beds, and approximates 20 miles in length and from 6 to 12 miles in width. At its southern end this depression is 500 feet and at its northern end 1,500 feet deep. It is surrounded by tertiary rocks that are called "the rim;" but to the east, north, and west, and at some distance away rise mountain ranges varying from 8,000 to 10,000 feet in height. From the rim of this depression the slopes are very precipitous. In some places they consist of high terraces of castellated rocks; in others the clayey bands have been carved into normal earth slopes; occasionally there are areas covered with a scanty vegetation, and in a few instances groves of pine and spruce. So steep, in fact, are the slopes that for a distance of 20 miles there is but a single wagon trail leading into the valley.

Water is scarce, though one sees a few small streams, with their spruce-clad banks. These break the monotony of the desert and lend a peculiar charm to the entire region. About the "rim" of this great depression, especially on the eastern and western slopes, are some of the most wonderful examples of Bad Land erosion found in America. They are of huge dimensions, rising from a chalky slope to a height of several hundred feet and extending for miles. The carving is elaborate; columns, spires, arches, and gateways are numerous, and their embellishment would do credit to any sculptor. Narrow cañons, with perpendicular walls 200 feet in height, are common occurrences, and add greatly to the attractiveness of the scenery. Here and there are small forests of pine and spruce, and jutting out from their dark green foliage are the white castles whose forms are too varied and complex to admit of description. As the setting sun gilds these broken spires and crumbling walls, and the deepening shadows bring out vividly their intricate designs, it needs no effort of the imagination to see in them the ruins of an aboriginal city which has crumbled away, and whose only occupants are the mountain wolves and lions and their only guard the hooting owl by night and the screaming buzzard by day.

The journey along the Laramie Range was full of scientific interest and large collections of rock and minerals were secured. Laramie Peak, the oldest landmark in the Rocky Mountains, was scaled, and other places of note along the western flank of the Laramie Mountains were visited. After being in the field 39 days the expedition returned to Laramie all well and in the best of spirits. Although there were many in the party and but few acclimated, there was no serious sickness during the trip. No accident occurred and no delays were occasioned by breakdowns or the loss of horses.

The results of the work accomplished will appear from time to time in scientific journals, as the discoveries are worked up; but the discoveries themselves are not all that should be considered of value. The field experience has deepened the interest and broadened the horizon of every member of the expedition. Young and old were

TERTIARY EROSION NEAR BEAR CAÑON



CASTLE LOMAX

alike enthusiastic over the opportunities offered by this region for field-work in geology. While they returned to their various spheres of duty enriched with material for use in their future class-work, they all carried home with them that lasting benefit and stimulus which are derived from contact with the keen minds of those working along similar lines of research under more or less varying conditions.

The courtesy of the Union Pacific Railroad Company will long be remembered by every member of the expedition. In many cases it made attendance possible where otherwise the expense of a long railroad journey would have been a difficulty that could not have been overcome. It is to be hoped that other railroad companies will follow the example set by the Union Pacific and take some suitable opportunity of furthering the interests of science by facilitating research in some region of geographic and geological interest.

GOLD IN THE PHILIPPINES

By F. F. Hilder,

Bureau of American Ethnology

In an article which I wrote for the National Geographic Magazine in 1898 * I referred to the existence of gold in the Philippine Islands in the following terms:

"Gold has been found in several of the provinces, but chiefly in the more mountainous and inaccessible localities, many of which are occupied by independent tribes that have never submitted to Spanish rule; but that the auriferous formations extend over a wide area in the island of Luzon is proved by the fact that in the alluvial deposits of every stream on the Pacific side some color of gold can be found. The islands of Mindanao and Mindoro are also equally promising fields for prospectors of gold. In many places the natives have extracted considerable quantities of gold dust by washing the alluvial deposits; in others gold-bearing rock is broken by them with hammers and ground in rude mills, such crude methods, of course, producing but poor results."

During the present year I have again visited the Philippines, and, although existing conditions were such that I could not personally visit the gold-bearing districts, I was enabled to obtain considerable information with respect to them from sources which I consider to be thoroughly reliable, and have inspected a number of samples of

* National Geographic Magazine, vol. ix, No. 6, June, 1898.

gold obtained from different localities. In the island of Luzon there are few provinces in which gold does not exist in greater or less quantity, in veins and ledges in the mountains or in the river sands and alluvial deposits.

One of the best known auriferous districts is that of Paracale, in the province of Camarines Norte, on the eastern coast of Luzon, where in the spurs of the mountains many veins and outcroppings of gold-bearing rock have been uncovered, particularly at Pinagalatinan, Imbongimbong, and Lugos, near Labo. In the former places the gold is in combination with iron pyrites, with a trace of copper, blende, galena, and chromate of lead in orange-colored crystals. In Labo the streaks or veins are gray in color, containing gold, blende, iron pyrites, and sometimes, although seldom, native copper. The general direction of these strata is from north to south, except in Gumihan and Lugos mountains, in which the trend is to the northwest. The width of the veins is from 1 to 5 inches up to 26 to 36 inches. Foreman mentions this district as follows: *

"In the time of Pedro Manuel Arandia (1754–1759) a certain Francisco Estorgo obtained license to work these Paracale mines, and five veins are said to have been struck. The first was in the Lipa mountain, where the mine was called 'San Nicolas de Tolentino;' the second, in the Dobójan mountain, was called 'Nuestra Señora de la Soledad de Puerta Vaga;' the third, in Lipara, was named 'Mina de las Animas;' the fourth, in the territory of San Antonio, took the name of 'San Francisco,' and the fifth, in the Minapa mountains, was named 'Nuestra Señora de los Dolores,' all in the district of Paracale, near the village of Mambulao."

He also says: †

"Estorgo's neighbors, instigated by native legal pettifoggers in Manila, raised endless lawsuits against him; his means were exhausted, and apparatus was wanted to work the mines, so he abandoned them."

These mines are at present operated by the natives, but in such a rudimentary and desultory manner that only a small portion of the gold is saved. The workings are seldom carried to a greater depth than 3 or 4 meters, but it is a fact which promises better results, whenever more scientific and practical methods may be brought to bear on them, that the ore always becomes richer as the depth is increased; but in all the hundreds of years during which these deposits have been known it is safe to say that their true value has never been tested. The natives carry the ore to the surface in baskets, and when water

* The Philippine Islands, by John Foreman, New York, 1899, p. 380.
† Op. cit., p. 381.

is struck they bale it out with buckets, either pulling them up with a rope or carrying them up a bamboo ladder. The gold-bearing rock is emptied from the baskets into a concavity in a rock or large stone, which serves as a mortar. The pestle or stamp consists of a stone about 25 pounds in weight, which is tied with a strip of bejuco to the end of a slender pole, which is rested obliquely against the fork of a tree. The laborer, taking advantage of the elasticity of the pole, uses it like a trip-hammer, and crushes the rock. The broken rock is then pulverized in a rude mill, consisting of a rough stone roller, which is revolved in a circular base by means of buffaloes. The pulverized material is then washed, generally by women, until there remains only a dark sediment, which is afterward smelted by placing it in a shell, covering it with charcoal, and using a small piece of bamboo as a blowpipe.

A sample of the metal obtained by this imperfect process gave the following analysis:

Gold	77.94
Silver	19.00
Iron	.05
Silica	3.00
Loss	.01
	100.00

Of course, the quantity of gold obtained is a very small fraction of that carried by the ore, and as the gold is bartered to Chinese peddlers and ambulant traders, the producers get but small return for their labor and are miserably poor. The ground between the mountains and the coast is mostly alluvial, and the village of Mambulao, in this district, has long been noted for the placer washings in its vicinity.

In the adjoining province of Tayabas gold has also been found in the hills or mountains around the town of Altimonan; also in many of the spurs of the Caraballo mountains, in alluvial deposits in the Gapan country and in the sands of the rivers Ango and Angalacan, in the province of Nueva Ecija, and in many places in the Caraballo de Baler country between that province and that of Nueva Viscaya. On the island of Polillo, lying off the east coast, it has also been obtained from the shores of the river of the same name. In the north of the province of Cagayan it has been found in the districts around the town of Pamplona; in the townships of Lanag and Bangui, in the province of Ilocos Norte; in the sands of the river Abra, which discharges near the town of Vigan, on the coast of Ilocos Sur. It has also been found in many places in the country inhabited by the Igorrotes and Igorrote-Chinese, in the district of Benguet, particularly near the villages of Gatapa, Bagnio, Capunga, Lutal, Automac, and Pangotcotan, near the latter of which some mines were worked by Mexicans during the last century; in the township of Batincoquin, in the north of Zambales province; in the rivers near the towns of Santa Maria and San Jose of Bulacan; in the Tierras de Caramoan, in the province of Camarines Sur; in the township of Ligao, in Albay; in the rivers of Lanating and Cayguran, in the province of Morong, and in the ravines and creeks of Macaburaboc and Camandag, near the town of Montalban, in the province of Manila. It will thus be seen that gold is widely distributed throughout the island of Luzon; how many of these deposits will prove to be rich enough to pay for systematic work and the introduction of machinery remains a problem which the future must solve, but I know that the owners of some of them are sanguine of securing good results whenever the country may be pacified and capital and labor shall be protected under American control.

In the great southern island of Mindanao gold has been found in many places, principally on the northern and eastern coasts, where its production has been entirely in the hands of the natives. What may exist in the interior is problematic, as the greater part of the island is unexplored. In the district of Misamis, in the northwest, there exist many alluvial diggings in the country between the Cagayan and Iligan Rivers. The principal placers are near the towns of Initao and Iponan, where nuggets have been found weighing as much as 1 to 2 ounces. In the neighborhood of Pigholugan, near Cagayan, small veins of auriferous quartz exist, from which, even by the crude native methods, considerable quantities of gold have been taken.

The gold-bearing district of Surigao may be considered as an eastern continuation of that of Cagayan de Misamis, and is of more importance, including the greater part of the district of the Canimon, Binutong, and the Canmarhat Mountain and the plains of Caningay. There are also deposits in Magong-Duangan and Danas, in the township of Caganan; placers in the township of Tibabangan, near Maquit, on the edge of Lake Sapongan; in the Tubay River, which discharges into the Bay of Butuan; also about four days' journey from the mouth of the Butuan River, near the villages of Lines, Finon, and Sulibas. In the veins and outcroppings in this district the gold is found mingled with pyrites of iron and copper, galena, and blende. I have seen a report in which it was stated that in a ledge near Canimon there had been found ore so rich that as high as 100 ounces of gold had been obtained from 75 feet of the vein.

The productiveness of this Surigao district has been known for centuries, but for many reasons the extraction of gold has remained in the hands of the natives. Foreman says:*

"A friend of mine, a French merchant in Manila, told me, in 1886, that for a long time he received monthly remittances of 4½ to 5½ pounds of alluvial gold from the Surigao coast extracted by the natives on their own account. In the same district a Spaniard attempted to organize labor for gold, washing on systematic principles, but he met with such opposition from the friars, who influenced the natives, that he could only have continued his project at the risk of his life, so he gave it up"

Sir John Bowring also mentions the Mindanao gold production:†

"Gold dust is the instrument of exchange in the interior of Mindanao, and is carried about in bags for the ordinary purposes of life."

While I was in Manila in April last (1900) Mr G. E. St. Clair, a mining engineer and expert of considerable experience, returned from a trip to the southern islands. He said that from the result of his investigation he regarded the island of Mindanao as one of the richest countries he has ever visited, considered from a mineral standpoint.

Gold has also been found in the island of Panay. The most notable locations are those in the vicinity of Astorga, in the township of Dumarao, in the beds of the creeks known as Calaomin and Dinogo. In this neighborhood are found dioritic rock containing numerous small veins of gold-bearing iron pyrites, rich enough to pay for working. Deposits of gold exist in Binatusan and Lausam below Mantubang; also in the country between the junction of the rivers Manyon and Badbaran with the river Panay. In the province of Iloilo the most noticeable gold deposits are those in the Abaca section of the township of San Curique and those in the township of Baratoc Viejo, in the northeast of the island, which are reported to be very rich.

This description includes the best known gold-bearing localities; but indications in several other islands, such as Cebu, Mindoro, Masbate, Negros, Palawan, and other smaller islands, are such as to lead to the belief that the metal will be found in them whenever they may

* Op. cit., p. 382.
† The Philippine Islands, by Sir John Bowring, London, 1859, p. 279.

be explored and prospected. The reasons why the gold deposits in the Philippines have never been exploited or properly utilized are so many and so varied that no adequate relation of them can be given within the limits of a magazine article. Some of them are, however, summarized in the following extract from Foreman's book:*

"As a general rule, failure in most Philippine mining speculations, no doubt, was due to the unwillingness of the natives to coöperate with European capitalists, and in this they found encouragement from the friars, who were averse to innovation of any kind. The native, too, in rural districts, would not submit to constant organized and methodical labor at a daily wage, to be paid periodically when he had finished his work. The class of natives whom one had to employ in the neighborhood of the mines was nomadic and half-subjected, whilst there was no legislation whatever in operation, regulating the relations between workers and capitalists. Indeed, the latter were quite at the mercy of the former, whose indolence entirely overcame their cupidity, so long as their immediate necessities were satisfied." . . . "Again, the wretched means of communication provided by the Spanish Government obliged the few enterprising capitalists to spend their money on the construction of roads which had already been paid for in taxes."

It is to be hoped that after centuries of oppression, misrule, apathy, and neglect a better and brighter day is dawning for these beautiful islands, when their abundant stores of mineral and vegetal wealth will be developed and utilized, when both capital and labor will be encouraged and protected, not only in the interest of the former, but to the immeasurable benefit and advancement of the people who will supply the latter.

THE TEACHING OF PHYSICAL GEOGRAPHY IN ELEMENTARY SCHOOLS

By Richard E. Dodge,

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One of the perplexing problems of supervisors and superintendents of schools and of all others who have to plan and set in operation an effective school curriculum is that of determining the position of physical geography in elementary school work. Five years ago educational leaders were as a rule willing and indeed eager to incorporate almost any amount of physical geography in their school courses

* Op. cit., p. 281.

and to emphasize it even in the earliest years of school life. With the accumulation of experience and with the increased emphasis given in school work to the so-called "socializing" of the child, the tendency unfortunately has been to allow the pendulum of practice to swing far away from rational physical geography, until in many instances school geography has come to be, not "a study of the earth in its relation to man (and life)," but a study of man, with occasional reference to the earth.

There is no doubt that both extremes have been unfortunate, and that the cause of physical geography, as well as that of industrial geography, has suffered through over-advertising and exploitation. It will only be a question of time, however, when the interest of the moment, passing to some other subject in the curriculum, the pendulum will return to its normal position, and all phases of school geography will receive their due amount of attention, and no more.

In the mind of the writer, physical geography has a right to a large amount of consideration in elementary schools. It must not, however, be taught as an end in itself, but as a means to an end, and that end, in the upper grammar grades, should be the causal understanding of geographical conditions over the world. Physical geography also has a place in the work of beginners in geography; but its place is not all-important. It must be brought in slowly as an entering wedge that shall be driven deeper as needs may require during the succeeding years, but which shall not be driven "home," perhaps, until the later intermediate years.

There are a few guiding thoughts that one planning a course of study may well bear in mind, which seem to have their bearing on the vexed question under consideration. In the first place, neither the geographical expert nor the pedagogical enthusiast is necessarily qualified to decide upon the place and amount of attention that physical geography is to receive in the school curriculum. The geographer may think only of the scientific ordering of his subject-matter, and may be over-anxious to train embryo scientists rather than to train children scientifically, so that they will understand and think about the geographical conditions about them and be ready and able to seek for new information and fuller knowledge. The child may, in consequence, be top-heavy from an overload of scientific study of land forms and climate.

On the other hand, the teacher who believes that child study has already proved to us the supreme interests of children at all ages, or who is convinced that "training for citizenship" or the study of "social dependence" demands the early emphasis of civics and a detailed study of industrial processes, may tell us that children have no interest in their relation to their physical environment; that they have but little need for the facts of physical geography (the stage) in order to understand human activities and progress (the play).

The leader in child study may very rightfully emphasize the need of being guided by children's interests and of making our school work serviceable. This does not mean, however, that we must follow children's whims or omit all that is not of immediate practical use in everyday life. It means that the interests of children must be ascertained, so that we may lead them forward from the unrelated known to the causally related known (or unknown) in such a way as to give them knowledge of important facts and principles and the ability to apply these facts and principles in everyday life. It means also the laying of the foundations of future culture by giving the children an insight into the unsolved problems of geography, and, further, it means training them "for citizenship" through making them logical and accurate in their thinking, open-minded toward the problems of the day, able to reach a decision and act on it with force and common sense. Physical geography introduced and developed with care, and gradually made the basis of other geography work, can do more than any other science that has a place in the elementary school curriculum in giving a training for intelligent citizenship.

The arrangement of the facts of physical geography in the elementary school must be decided by the scientist, the leader in child study, and the practical teacher working together. The scientist should determine the field to be covered and, in a general way, the order of steps to be followed in the work, and should see to it that the pupils receive training in accurate and scientific thinking; the child-study expert should be able to show how the selected facts may be used with the greatest effect and the least waste of energy on the part of teacher and pupil; and the practical teacher, who knows his children better than any one else, and who alone sees the practical possibilities, should select the details, arrange them so as to be of the greatest value and assistance in the development of the pupils, and yet so rationally that neither the pedagogical expert nor the geographer can offer valid criticism or rebuke.

The way will be made more easy if, so far as possible, in physical geography, as in other subjects, the children be led forward so gradually and systematically that need is developed for a fact or a principle before it is presented. Children should be led and not driven to the study of geographic controls. To follow such a progressive plan means in the early years a different method of study from that in the later years, when the children can work longer at a given task without variations, and when they can think more logically and consecutively. Whatever is done at any stage should be done in such a way that causes and consequences are necessarily related, though it is wise to remember that the consequences that deserve emphasis are not always the physical, but more often the human consequences following certain physical causes. In the earlier years pupils may study the consequences and gradually be led to see the fundamental causes of topography, climate, drainage, etc., that exercise a control over life. Such a plan rightfully followed should give good, practical mental training, should keep uppermost the human phases of the subject, and throughout a need may be created in the children's minds for a more thorough study of the causes in later stages.

Such a study of the physical facts in a somewhat extensive manner naturally follows, and in turn the elements of physical geography should be followed by a more full and careful study of the consequences of the present and past time, that can only be really appreciated as they are seen in the light of their environment. We might express it in some such way as this: that in the early years the children should be led to see some causal arrangement in the apparent chaos of physical, industrial, and social conditions with which they are always surrounded, thereby laying the foundations and the need for the study of pure science—the causes. After the causes have been elaborated as fully as time and the needs of the pupils allow, the pure science (physical controls) should be made the basis of work, so that the applied science (history, civics, and social conditions) may be taught understandingly.

It is not intended to imply here that present social conditions are entirely due to the physical environment, but that the physical environment should be given the emphasis due it in each case; that where physical controls are important, for instance, in determining a boundary, they be noted, and when politics have fixed a frontier, that the failure to follow the natural boundary be also noted and accounted for.

One advantage of such an inversion of the plan of procedure is the variation in method of study as the years go on. Geography in the upper grades thus taught is not merely a duplication of the work of the earlier years, with more details to create work for pupils; it becomes more rich and more full of significance, and the method may be made so different that pupils hardly realize they are covering the same ground. Instead of the circle outside a circle, or concentric method, it may be said that a circle is drawn in the early years; that then the circle is turned inside out, like a glove, and that the later work is built around it.

Furthermore, such a plan allows the human conditions to be emphasized in the earlier years, when the children are as a rule interested in what people are doing. It should be noted, however, that they are also interested in *why* people do certain things, which is one of the reasons for leading from consequences out to causes. As soon as we can get a *why*, there is a logical reason for giving the causes, and our children are thinking ahead and creating a need for more and richer food. They cannot become parrots or mere absorbing sponges. Children do not ask *why*, however, until they have seen the fact to be explained, which suggests that the study of consequences should precede the study of causes in the early years.

The method briefly suggested as pertinent to the more advanced years, when properly put in operation, demands a use of physical geography that renders it unnecessary to have a special course in physical geography in the earlier high-school years. Many facts must, of course, be omitted that might be included in a first-year high-school course; but all the necessary physical controls of life may be studied scientifically and thoroughly, and made permanently of value through being applied and used in everyday school work, so that the scientific study of physical geography as such may be deferred until the later years of the secondary schools. Such a plan, furthermore, allows the best ideas of all leading schools of geography teachers to be woven together in such a way as to prevent one-sidedness, while ensuring good, thought-provoking work that is of practical, everyday value, and, further, that lays the foundation for later, better work. With such a plan, neither the physical geographer, the commercial geographer, nor the sociologist can rightfully claim that the pertinent facts of his field have been neglected until the children are dulled to their beauty and importance.

The working out of a course of study so that the attention given physical geography shall gradually be increased in amount and in significance as the years advance is not an easy task. From the whole field of physical geography there must be selected those facts that are of the greatest value; these facts must be arranged so that progress is assured without over-repetition, and must be related to the conditions of which they are the causes, so that the knowledge of both causes and consequences is enriched through such a causal study. A course of study planned along these lines is now in operation in the Horace Mann School of Teachers College, and is proving itself rational and effective. The more important facts of physical geography are developed by the middle of the sixth year in school, as the natural outgrowth of a study of life conditions. In the remaining work of the geography course physical geography is made fundamental, and good history and good geography will result. By the end of the eighth year the pupils have gained a good insight into the earth sciences and have had such training in scientific thinking that no more geography work is advisable until toward the end of the secondary course. By the third or fourth year of the high school course it is possible to take up a study of physical geography that answers the requirements in physiography for entrance to Columbia and Harvard Colleges. Thus the arrangement of geography below the college, that Professor Davis has recently stated would be in fashion twenty or thirty years hence,* has been proved a very successful possibility. The primary essential of such elementary school work is that the teachers, who cannot be experts in all things, shall at least know more geography than their pupils are expected to know on entrance upon a secondary course. This necessity may be acquired at the end of another generation, but progress will unfortunately be slow.

GEOGRAPHY AT THE BRITISH ASSOCIATION

Geography occupies a much more conspicuous place in the proceedings of the British Association for the Advancement of Science than in those of the American Association. There is never any lack of valuable papers to be presented, and almost every meeting has its special attraction in the fact that some newly returned explorer avails himself of the opportunity of narrating before a large and distinguished audience the story of his discoveries and adventures.

* Physical Geography in the High School, School Review, Sept. and Oct., 1900.

The Bradford meeting of 1900 formed no exception to the rule, being one of the most successful in recent years, both from the popular and scientific standpoints. A large audience greeted the president of the section, Sir George S. Robertson, of Chitral fame, when he rose to deliver his address on Political Geography and the Empire, while still larger audiences thronged the hall when Mr C. E. Borchgrevink gave his description of the British Antarctic Expedition of 1899–1900, the first expedition that ever wintered on land within the Antarctic circle, and Captain H. H. P. Deasy described the incidents of his great journey in central Asia.

Of the miscellaneous papers, two, at least, had an interest extending far beyond the audiences to which they were primarily addressed. The first place, from an American standpoint, should be given to Mr G. G. Chisholm's paper on Some Consequences that may be anticipated from the Development of the Resources of China by modern Methods. The author pointed out that China is the only region in the world with all the means for industrial development on a gigantic scale that remains to be opened up. The countries that have been opened up within the past thirty or forty years have none of them possessed great resources for industrial development. Among the important results that may be expected to follow the adjustment of the present disturbed conditions in China the author mentioned:

1. A rise in prices in China, especially in the industrial regions.

2. The creation of a demand for foodstuffs not likely to be supplied by China itself, a demand which in itself will be one of the most powerful causes contributing to maintain the rise in prices.

3. The imparting of a great stimulus to the food-producing regions most favorably situated for meeting this demand, more particularly Manchuria, Siberia, and western North America, probably the Pacific States of North America to a greater extent than Canada.

4. Perhaps the most important of all, the creation of a tendency to a gradual but prolonged rise in the price of wheat and other grains all the world over, thus reversing the process that has been going on since about 1870 in consequence of the successive opening up of new countries.

Another important paper, read by Mr T. G. Rooper, one of Her Majesty's inspectors of schools, dealt with the Progress of Geographical Instruction in Elementary Schools. The following, he said, were the principal defects in the existing methods of instruction: (1) Lessons in geography were not based on object teaching, nor on the observation of local features and scenery; (2) the art of "reading" maps was not taught, nor was the construction of a map led up to by making plans of short walks and diagrams of the neighborhood; (3) the study of political and commercial geography was not based upon the study of physical geography, neither were the details of geographical study connected as cause and effect. There was no attempt to present a country to the scholar as a connected whole, and the lessons consisted of lists of names and figures, at the best arranged in groups. The chief reforms consisted, said Mr Rooper, in the intelligent study of local geography through local maps and models, and in object lessons which explained the principles of physical geography. The reliefs and models led up to the art of reading maps and to the demand for better maps. Such lessons were an excellent introduction to reasoning, and proved how little there was that was purely arbitrary, even in the sites of towns and villages in the neighborhood, much less in the industries which were carried on in them. The symbols on wall maps were vague and meaningless unless a context and significance were given them by previous practice in the building up of local plans and maps. The scholar should be carefully taught how to translate the symbols back into the forms of nature which they inadequately represented. The value of graphic work in the teaching of geography was strongly emphasized. The mere copying and coloring of maps by the pupil was rather an exercise in drawing than in geography. Each map should be drawn to serve some definite purpose. It should disentangle from a complex whole some particular part which analysis brought to light, and illustrate it with precision and simplicity. Further, the sketch maps should proceed from the simpler to the more complex, and no map should be made of a country as a whole until the leading features had been dealt with separately, the constructive method being thus applied to the teaching of geography.

The delicacy of the instruments now used for the detection of earthquake disturbances was thoroughly appreciated by the audience to which Prof. J. Milne made the surprising statement that no fewer than 130 earthquakes were recorded at Shide, in the Isle of Wight, last year. Of these disturbances, 125 had suboceanic origins, the Pacific origins being, with the possible exception of one group, on the face or at the bottom of those remarkable "deeps" which are found along the eastern and western margins of that ocean. Professor Milne stated that as there are reasons for believing that each of the earthquakes was accompanied by large mechanical displacements of solid materials, the safety of the deep-sea cable systems of the present and the future calls for the definite localization of the regions of most frequent and serious disturbance. Analysis of earthquake records has increased our knowledge respecting the rates at which motion is transmitted through the earth, and indirectly thrown new light upon the earth's rigidity. The distance of a place of origin from a given station can now be determined, either from the interval by which the preliminary tremors outrace the larger surface waves, or from the interval between the arrivals of waves which have traveled from their origin round the world in opposite directions.

Among other noteworthy papers to which only passing reference can be made were Mr E. G. Ravenstein's on Foreign and Colonial Surveys and on the Geographical Distribution of Relative Humidity; Dr H. R. Mill's on the Treatment of Regional Geography, which seems to have brought out a general expression of opinion that the most convenient unit for such descriptions is the county rather than the map-sheet, and Sir Thomas Holdich's discussion of Railway Connection with India. These, however, are only a few of the interesting topics to which the attention of the Section of Geography was directed, and it is impossible to look over the report of the proceedings without a feeling of regret that in our own American Association there is no separate section devoted to a science that alike on its physical, its economic, and its political sides is of the most profound interest and consequence to the people of the United States.

J. H.

DECISIONS OF THE U. S. BOARD ON GEOGRAPHIC NAMES

The following are the decisions rendered by the U. S. Board on Geographic Names at its eighty-sixth meeting, held October 10, 1900. The decisions rendered at the eighty-fifth meeting, held June 5, 1900, were printed in the NATIONAL GEOGRAPHIC MAGAZINE for August, 1900, pp. 329–330. All prior decisions, covering a period of about 10 years, are contained in the Second Report of the U. S. Board on Geographic Names, printed by Congress last May as Senate Ex. Doc. No. 472, 56th Cong., 1st session. The Board has no copies of this report; application should be made to Members of Congress.

Ansley; island in Swanson Harbor, Chatham Strait, S. E. Alaska. (Not Astley.)

Carmichaels; borough and post-office, Greene County, Pa. (Not Carmichael nor Carmichael's.)

Catlin Mill; creek, branch of Catharine Creek, Schuyler County, N. Y. (Not Catharine Mills.)

Chilson; lake, Essex County, N. Y. (Not Long Pond nor Paragon Lake.)

Cliff; point on southeastern shore of Pearse Island, Portland Inlet, S. E. Alaska. (Not Base nor Rose.)

Coatue; beach and point, Nantucket Harbor, Nantucket, Mass. (Not Bogue, First, nor Hanloetoe.)

Cone; mountain on east bank of Stikine River near the Alaska-Canada boundary. (Not Cane.)

Coskata; beach, life-saving station, and pond, Nantucket, Mass. (Not Coskaty nor Croskaty.)

Emmet; post-office, railroad station, and township, Nevada County, Ark. (Not Emmett.)

Entiat; river, Chelan County, Wash. (Not En-ti-at-kwa, Entiatqua, etc.)

Gravette; post-office and railroad center, Benton County, Ark. (Not Gravett.)

Green; point, the northern point of entrance to Pyramid Harbor, Lynn Canal, S. E. Alaska. (Not Pyramid nor Zelonoi.)

Gross; point, the west point of entrance to Orland River, Hancock County, Me. (Not Gross's, Leach's, nor Spark's.)

Katzehin; river tributary to Chilkat Inlet, from the east, S. E. Alaska. (Not Chkazhin nor Katsehin.)

Labouchere; island at entrance to Labouchere Bay, Sumner Strait, S. E. Alaska. (Not Ship.)

Leake; township, Nevada County, Ark. (Not Lake.)

Lone; mountain on and near north end of Admiralty Island, S. E. Alaska. (Not Barlow.)

Maxcy; pond, Nantucket, Mass. (Not Maxey.)

Napean; point on southeast shore of Admiralty Island, S. E. Alaska. (Not Nepean nor Nepÿen.)

Nobadeer; pond, Nantucket, Mass. (Not Nebadeer, Nobadee, nor Nobodeer.)

Paoha; island in Mono Lake, Mono County, Cal. (Not Anna Herman.)

Pimnys; point, Nantucket Harbor, Mass. (Not Pimney's.)

Polpis; harbor and village, Nantucket, Mass. (Not Poadpis nor Podpis.)

Red Bay; mountain in northern part of Prince of Wales Island, S. E. Alaska. (Not False Mount Calder.)

Rheas Mill; township, Washington County, Ark. (Not Rhea Mills.)

Sail; island off False Point Pybus, Frederick Sound, S. E. Alaska. (Not Ship.)

Sanford; cove in Endicott arm of Holkham Bay, S. E. Alaska. (Not Sandford.)

Scull; islet in Young Bay, Stephens passage, S. E. Alaska. (Not Skull.)

Shimmo; point, Nantucket Harbor, Nantucket, Mass. (Not Abram nor Shemo.)

Spruce; island off Pybus Bay, Frederick Sound, S. E. Alaska. (Not Yelowy nor Yellowy.)

Starr Hill; township, Washington County, Ark. (Not Starrhill.)

Sumdum; island in Endicott arm of Holkham Bay, S. E. Alaska. (Not Sand nor Soundon.)

Trots; hills, Nantucket, Mass. (Not Trott's.)

Weweeder; ponds, Nantucket, Mass. (Not Weedweder nor Weeweder.)

Whitley; township, Crawford County, Ark. (Not Whitney.)

Wigwam; pond, Nantucket, Mass. (Not Toochka nor Toupchue.)

SOME SIGNIFICANT FACTS CONCERNING THE FOREIGN TRADE OF GREAT BRITAIN

Mr Michael G. Mulhall contributes to the June number of the *Review of Reviews for Australasia* an article on the subject of British trade, which presents some facts of far-reaching significance with great clearness and force. The article is summarized by the author in ten paragraphs, which are substantially as follows:

1. The weight of the merchandise annually imported into Great Britain has multiplied fivefold in forty years, averaging at present more than one ton yearly for each inhabitant.

2. More than half of the food supply of the United Kingdom is drawn from other countries, at an annual cost of about £5 ($24.33) per inhabitant.

3. The mean price of imported food is now only £12 10s. ($60.83) per ton, having fallen 20 per cent in the last twenty years.

4. Most of the imported food could be raised in England, but at much greater cost, to the detriment of the working classes.

5. The consumption of fiber in the mills of Great Britain has doubled in thirty years, and exceeds the aggregate consumption in France and Germany.

6. The importation of metals and minerals has grown elevenfold in thirty years, and the exports of hardware manufactures have doubled in value.

7. The consumption of manufactured goods imported from foreign countries has risen from 15s. ($3.65) per inhabitant in 1869 to 41s. ($9.98) in 1899.

8. The value of textile goods exported is less than it was thirty years ago, but the volume has risen 70 per cent.

9. The fall of prices has been a gain to Great Britain of at least £50,000,000 ($243,325,000) per annum.

10. The tendency of British trade points to a steady increase of food imports and of hardware exports.

The recent dredging of the Dniester has rendered the river navigable by barges for a distance of 70 miles from its mouth, thus greatly facilitating the Odessa grain trade.

The magnitude of the Norwegian fishing industry cannot be better illustrated than by the fact that, although the season of 1899 was one of the poorest on record, the catch included 34,500,000 cod and 136,000 tons of herring.

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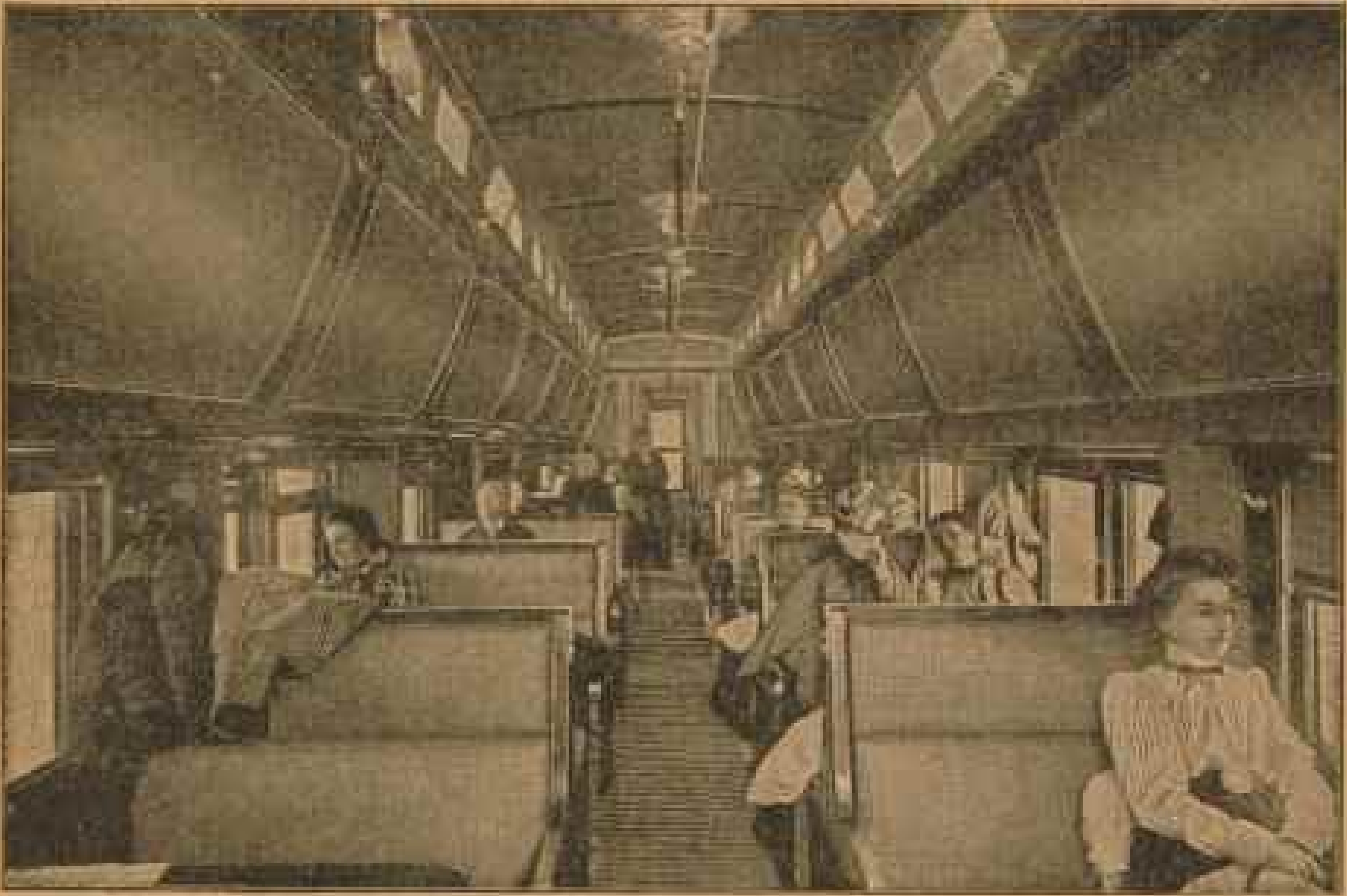

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