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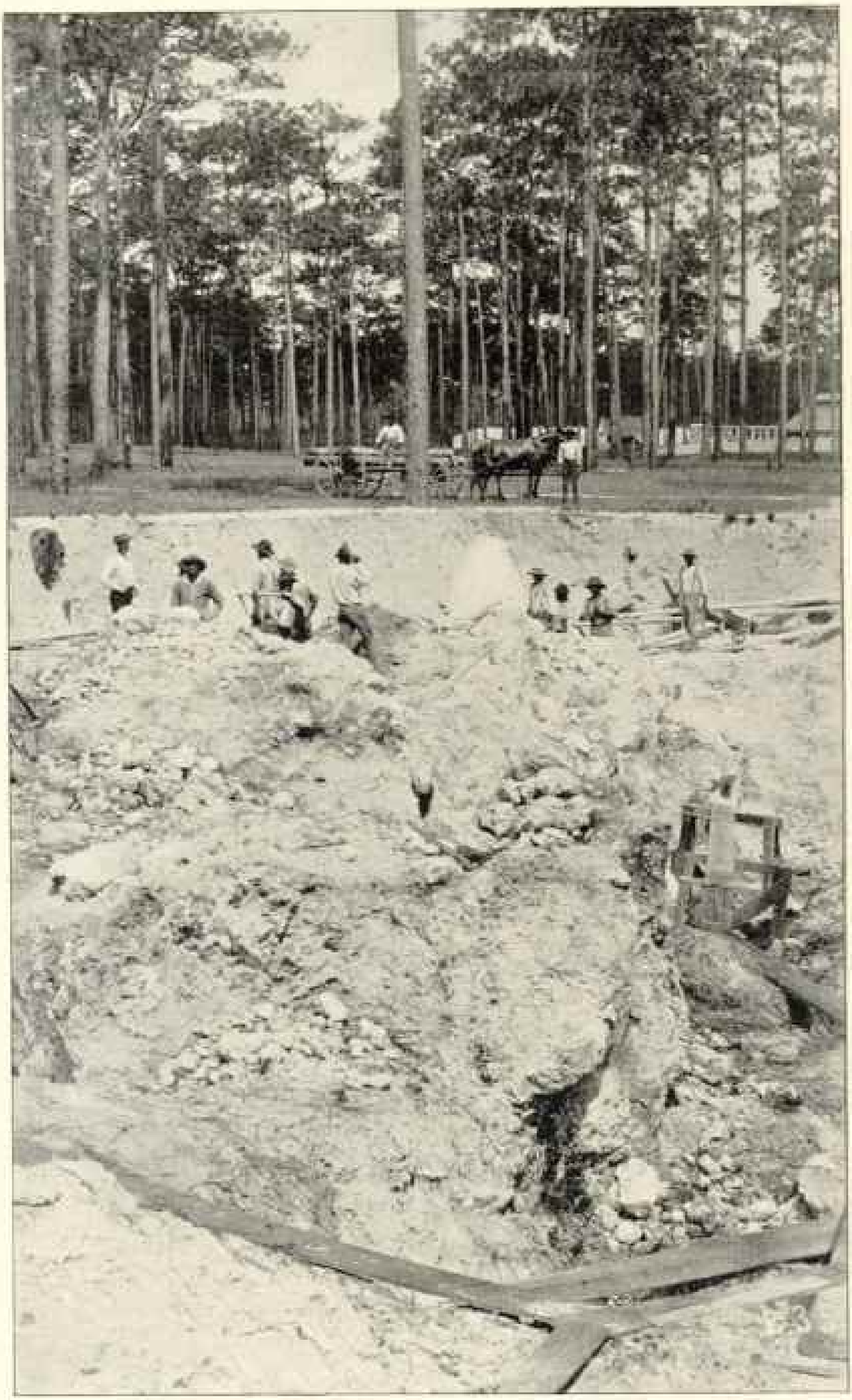

PHOSPHATE MINING ON THE WEST COAST OF FLORIDA

THE

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THE GEOGRAPHY OF THE SOUTHERN PENINSULA OF THE UNITED STATES

By The Rev. John N. MacGonigle

The study of the geography of the southern peninsula of the United States began about 400 years ago. Although the Great Admiral had not found the mainland of the Western Hemisphere, he had planted the standard of Spain on its adjacent islands, and his reports had kindled the spirit of adventure and awakened the hope of greater discoveries. In 1498 an expedition led by Pinzon and Solis entered the gulf of Mexico and made the harbor of Tampico, sailing thence around the whole of the Gulf coast, circumnavigating the southern peninsula, and journeying northward as far perhaps as the capes of Chesapeake bay. Of this successful voyage Ledesma and Americus Vespucius were the pilots, and it was doubtless from their charts that the first map of the peninsula was made. This map was made in Portugal, by some one unknown, for Alberto Cantino, who carried it to Italy to the Duke of Ferrara in the autumn of 1502. The original may now be seen in Modena, where it has been since 1880. One recognizes at a glance its singular correctness, at least as to its general outlines. It shows the deep indentations of the west coast and hints at the characteristic lagoon on the east. Without much difficulty and with reasonable certainty we can make some identifications. The River of the Palms is the Apalachicola, the Cape of the End of April is the southern point of the peninsula, the River of the Canoes is the Matanzas, and the River of the Alligators the St. Johns. Both this and the *Tabula Terre Nove* of 1508 were supposed to exhibit the new world, and therefore to include in Florida the

whole of North America. How widely they were published we do not know, but they doubtless aided greatly in the conduct of subsequent expeditions.

Added to the other impulses toward discovery which marked the twilight of the fifteenth century, the love of life contributed its strong motives. In a book which might have been dedicated to Ananias, John Mandeville told of a fountain in eastern Asia of which he and his fellow-travelers had drunk freely, and ever since had known new life, instinct with the strength and joy of youth. To find this fountain of youth became a new quest of the voyager. From Porto Rico, in the island of Hispaniola, Juan Ponce de Leon set sail in March, 1512. From the folklore of the natives of Hispaniola he had learned that the fabled fountain would be found in Bimini, a little island of the Bahama group. He had authority from the king to conquer Bimini. His course, however, led him too far to the westward, and on March 27 the white sands of the southern peninsula came in sight. It was Pascua Florida, or Easter Sunday, and the new land was named Florida. Terra Florida it has been ever since, not only because Ponce de Leon reached it on Pascua Florida, but because it is a land of flowers. On April 2 Ponce de Leon landed at about 30° N., but sailed away again immediately, making his way around the peninsula to latitude 27° 30′, whence he sailed home. In 1521 he returned to colonize his territory. The Indians met him with savage resistance, and instead of the fountain of perpetual youth he found defeat, receiving an arrow wound which resulted in a lingering illness and his death in Cuba.

The portion of the state of Florida to be considered in this article lies between longitude 3° and 6° 30′ west of Washington and between 24° 30′ and 30° N. latitude. It has the Atlantic ocean on the east, the gulf of Mexico on the west, and the strait of Florida on the south. Close to its eastern shore is the Gulf stream, in many places not more than two miles distant.

The geology of Florida presents no grave or complicated problems. Lying immediately beneath the surface is a limestone which persists through the entire length of the state. This doubtless belongs to the Eocene system. The limestone, which forms the crest of a fold known as "the ridge," is very permeable by water. It is characterized by enormous sink-holes and subterranean streams. It forms the beds of the middle rivers and of the countless lakes. Lying to the west of this limestone ridge are those marvelous deposits of phosphates which are found

along the west coast of the peninsula. East of the ridge, and more especially where it approaches the Atlantic, we find the coquina beds of sand and shells, which, with varying structure, form the barrier between the sea and the great coastal lagoon.

The peninsula naturally separates into three divisions; the middle portion, which comprises the beautiful lake region; the west coast, which slopes away from the high ridge to the gulf of Mexico, and the east coast, whose sandy levels are protected from the Atlantic by the great coquina atoll, extending from the mouth of the St. Johns river to the shores of lake Worth. Each of these divisions differs wholly from the others, presenting conditions and characteristics peculiar to itself.

Middle Florida is a broad ridge which reaches at places an elevation of nearly 250 feet. The soil is for the most part sandy, but like that of the state in general, it contains a sufficient quantity of phosphate to render it fertile. Forests of pine are everywhere. Here and there a cypress swamp varies the scene, and now and then a palmetto hammock suggests the approach of the tropics. It is in this division the lake region is found. Dotting the landscape like jewels of crystal in a field of green are numberless lakes, varying in size from a gem-like lakelet to the broad expanse of Okeechobee. Within a radius of 5 miles from Winter Haven 100 have been counted, and within 7 miles of Orlando there are known to be 150. With Gainesville as its northern limit and including lake Okeechobee on the south, this region contains at a conservative estimate at least 30,000 of these lakes and lakelets. They are not, as many imagine, the result of surface drainage or the reservoirs of sluggish streams. Many of them find their chief supply in the hidden sources of the great limestone which forms their beds, and some of them are connected by subterranean channels. It has frequently been observed that the fall of one means the rise of another. In some cases the water has disappeared entirely for a long period, only to return again, sometimes quite unexpectedly. Their waters are pure and they abound in fish. Clustered around them are the homes of thousands of people who have been driven south by diseases of the throat and lungs. The pine forests, the dry soil, the elevation above the not distant coast, the soft air and the healing sunshine insure almost entire immunity from pulmonary affections.

It is in this region that many of the great springs of Florida are found. The famous Silver spring lies just on the edge of

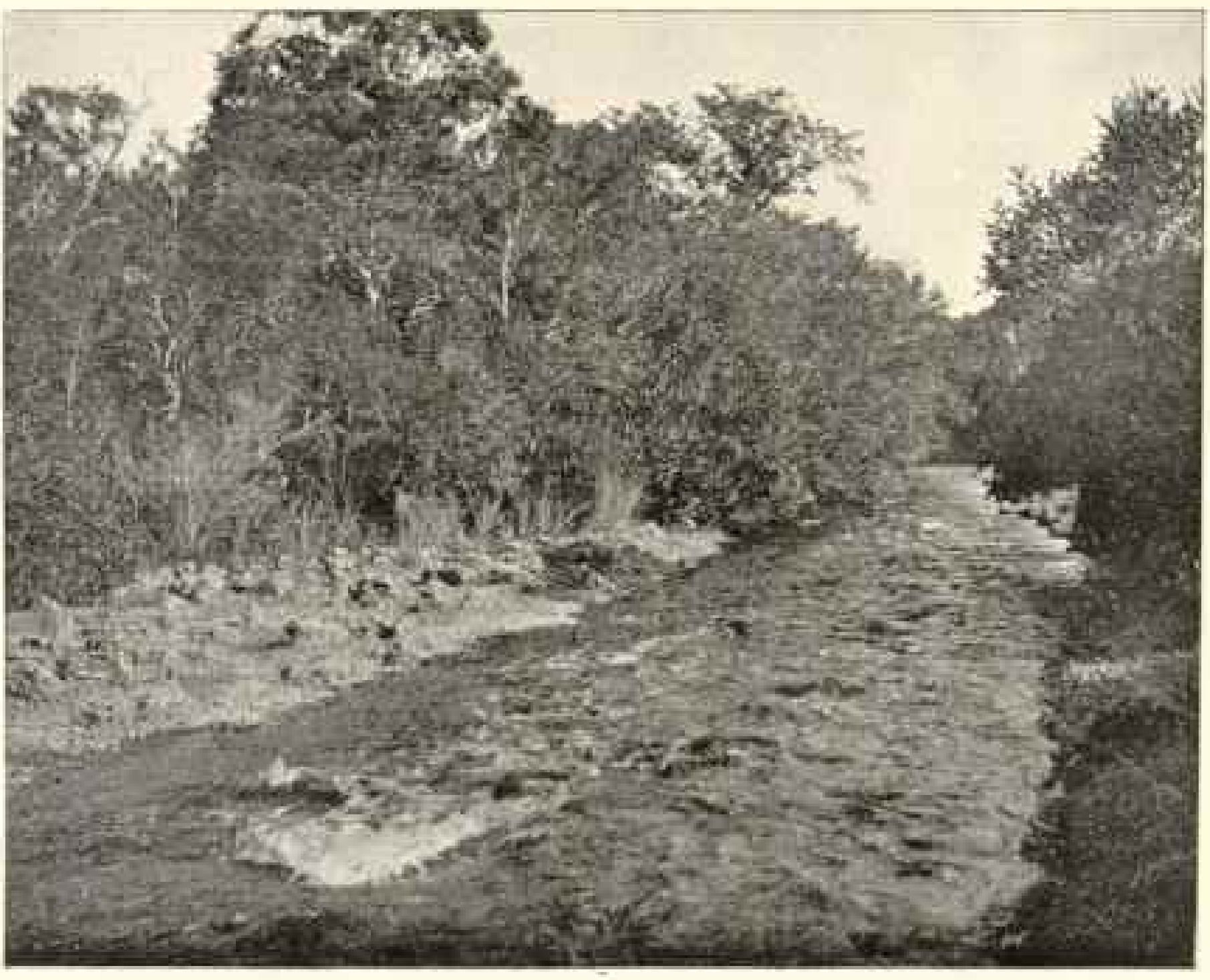
the middle belt. De Leon spring, fabled as youth's fountain, and the strange Blue spring, with its ultramarine waters, are the most notable of these whims of nature.

The west coast region slopes gently away from the middle ridge until it touches the Gulf. It is traversed by rivers whose beauty it is impossible to describe. Rising in swamps and morasses, they make their way by countless windings to the Gulf. Overhead the trees twine their branches into one unbroken canopy, shutting out the sunlight. On the banks are lands of great fertility, devoted in some cases to grazing and in others to gardens, whose early products reach the north while that region is still enveloped in ice and snow. The far-famed Suwanee river rises in the edge of the Okefenokee swamp in Georgia, and after a course of 240 miles empties into the Gulf. The Withlacoochee takes its rise just west of Kissimmee, and after almost losing itself in the spread of its waters, eventually reaches the Gulf in Withlacoochee bay. The Caloosahatchee has its headwaters in the secret recesses of the Okaloocoochee slough, and as it approaches the coast it widens into a majestic stream. Through the drainage canal of the Disston Company it is connected with lake Flirt, lake Hicpochee, and lake Okeechobee. A voyage, unique in every circumstance, may be made by steamer from Punta Rassa, following the river, the lakes, or the canal as far inland as Kissimmee, where one sees the spreading cane fields redeemed by drainage at St. Cloud.

Along the brinks and in the beds of these streams are found one of Florida's chief sources of wealth, the great phosphate deposits. These deposits furnish the purest form of phosphate of lime found in nature, a fact especially significant of the manner in which the minerals of the west coast have in general been deposited. Hundreds of thousands of tons are taken annually to Tampa, Punta Gorda, and Fernandina to be forwarded to foreign ports or American manufactories for conversion into commercial fertilizers. There are also here enormous bodies of sedimentary limestone, fuller's-earth, and kaolin, all of unusual purity, due to the peculiar conditions of their deposition.

The Gulf coast is indented by many bays. These bays, from Suwanee to Sanibel, are dotted with tropical islands, and are bounded on the one side by coasts of unfailing verdure and on the other by the blue waters of the Gulf. Chief of these are Tampa bay and Charlotte harbor, the terminals of two great railway systems. Here one may take steamer for the West

ON THE ST. JOHNS RIVER



FALLS OF THE MIAMI RIVER

Indies or South America, or, choosing smaller craft, find endless summer. He may go with the sponger, who plies his trade on the great sponge reef in the Gulf; may ply the open waters for the silver king of the sea, the tarpon, or may find in the interior whatever his heart desires in the chase for deer and bear, or in that supreme idleness to which the climate induces.

Dividing the middle region of the lakes from the east coast is the St. Johns river. This river enters the Atlantic at Mayport, in a broad, open sweep of water. Running parallel with the Atlantic coast, it is navigable southward as far as Sanford. At some points narrow and crooked, it elsewhere widens into sheets like lake George, 5 miles wide and 15 miles long. Never more than 30 miles from the ocean, its headwaters are not 10 miles from the great lagoon in Halpatiokee swamp, a saw-grass region not unlike the Everglades. The scenery of this great river changes continually. Banks that are green with cypress and fragrant with magnolia and honeysuckle give place to orange groves and gardens, or widen out into a prairie fringed with low palmettos, over whose tops high pines appear. The chief tributary of the St. Johns is the Oklawaha, whose windings through intricate masses of vegetation, by floating islands and bayous haunted by alligators, afford a voyage of rare beauty.

The east coast proper is formed by the coquina ledge, which is found all the way from Anastasia island to the southern limit of Palm beach. This ledge for varying distance along its western border incloses the great lagoon. This lagoon is known by various names; in its extreme northern development it is the North river, then the Matanzas. Here the ledge shuts off the sea until it reaches Smiths and Mala Compra creeks. Beyond this the estuary has its own way, forming the Hillsboro, Halifax, Banana, Indian, and Jupiter rivers and lake Worth. The southern end of the lagoon is in lake Worth, unless it should hereafter be discovered that the coquina ledge continues to cape Florida, in which case Boca Raton, New River inlet, and Dumbfoundling bay will be included. The lagoon is sometimes a broad, deep stream, sometimes a shallow bayou or lake of brackish water. It is flanked on either side by the characteristic belts of the coast. First comes the white sand beach, which is succeeded by sand-dunes covered with beach grass, sea oats, wild morning-glory, and saw-palmetto, changing to red bays and cedars. This is often succeeded by a half-hammock of tall trees and vines. Inside the lagoon is the very fertile belt of the high hammock,

composed mostly of oyster shells and fringed on its western end with pine. Following this is the low hammock of deep, black, exhaustless soil, the growths of which are picturesque and tropical, and last the yellow pine or flat woods where the negro and the cracker find their homes. Between the arms of the lagoon a channel 60 feet wide and 6 feet deep has recently been dredged, with the result that one will be able this winter to enter the lagoon at St. Augustine in a naphtha launch or house-boat and sail all the way to bay Biscayne. Leaving St. Augustine, with its old Spanish streets and frowning fortress of San Marco, the voyage lies

"Thro' leafey alleys of verdurous valleys"

to Ormond on the Halifax. Further south lie Daytona and New Smyrna, the site of old indigo and cane fields, English failure and Minorcan misfortune; next come Canaveral light and at length the broad pineapple fields of the Indian river; then the narrows of the Indian and Jupiter rivers to Jupiter light. A canal passes into lake Worth, where nature and art have combined to produce tropical conditions. Thence it extends to New river and by succeeding reach of river and creek and canal into bay Biscayne; thence south through bay Biscayne inside the keys, or outside the keys through Hawk channel to Key West.

The products of the peninsula are so well known that I give them but a passing notice. The orange was for many years the chief object of labor and culture. In 1893–94 the crop reached the enormous output of 5,500,000 boxes. Then frost killed to the roots 90 per cent of the trees. Sixty per cent of these grew again from the roots and some will bear this year. Three years hence the crop will probably aggregate 5,000,000 boxes. A country of one crop, however, is, like a man with a pet virtue, of doubtful character, and Florida has learned the lesson of the freeze to good effect. Next to the orange is the pineapple, of which this year probably 80,000 crates have been shipped. Added to these, everything in the nature of fruit or vegetable that the temperate zone produces may be found ripening in our gardens for shipment to the north while the farms and gardens and orchards of that region are yet deep in the sleep of winter.

The climate of the peninsula presents so many phases that only an exhaustive study can do it justice. The chief interest, however, centers in its winter conditions. The disposition to escape from the rigors of the northern winter is gradually increasing, and the number of people able to do so is likewise on

the increase. Such meager details as it is practicable to introduce into this article but poorly express the actual experience. At Tampa during December, 1895, and January and February, 1896, the following observations were made: Maximum, for the period observed, 80°; minimum, 32°; mean, 59°; greatest daily range, 32°; average number of clear days per month, 12; of partly cloudy, 12; of cloudy, 6. At Jacksonville for the same period: Maximum, 80°; minimum, 24°; mean, 55°; greatest daily range, 41°; clear days, 15; partly cloudy, 9; cloudy, 6. At Jupiter for the same period: Maximum, 83°; minimum, 37°; mean, 63°; greatest daily range, 24°; clear days, 8; partly cloudy, 13, and cloudy, 9. These figures show that the climate becomes more equable as you go southward. This is equally true of the coasts and of the interior, the winter climate of the lake region being of great equability.

For all varieties of pulmonary disease the middle region is a genial sanitarium. The east coast particularly affords relief for all forms of what is called "americanitis" or nerve exhaustion. That the climate is eminently suited either for rest or for increased mental activity and labor I can bear personal testimony. It is the climate *par excellence* for the student.

In March, 1892, Mr James E. Ingraham conceived the idea of, and at once proceeded to organize, an expedition for the exploration of the Everglades. The expedition experienced the greatest hardships, but its object was accomplished, and it is chiefly to its records that I am indebted for the following description.

The Everglades consist of two great basins lying between lake Okeechobee and the extreme southern point of the peninsula. The floor and rim of these basins are formed of a limestone which is doubtless a continuation of the rock composing the central ridge or backbone of the state. On the edges or rim where the rock is exposed it presents a very singular appearance. Here it is weathered and water-worn into the peculiar shapes which gave rise to the early opinion that Florida was of coraline formation. The pressure of the floods of water pouring over the sides or through the edges of this rim has worn away the softer portions of the rock, leaving the harder substance to present a somewhat coral-like structure. The color varies from cream to dark brown, owing to the black water, so called, which issues from the glades. This rock not only persists throughout the

glades, so far as explored, but seems also to be present in the river beds to the south, through which the water of the glades finds an outlet.

To the north the water empties into lake Okeechobee; to the west, south, and east it flows through various rivers into the Atlantic and the Gulf. The evident elevation of the area above the east, west, and south coasts precludes the idea of drainage from surrounding areas, and we must look elsewhere for the sources of the water. These, I think, are found in part in precipitation, and, in part, in subterranean streams or springs. The rainfall over this vast area of three million acres must be very great. But when we remember that all the creeks and rivers lead out of and not into the glades, the rainfall, which possibly approximates an average of ten inches per month during the months of June, July, and August, is not sufficient. From what we know as to the subterranean relations between the lakes in the lake region, from the well-known conditions of Silver, Blue, and De Leon springs, as well as from data acquired by drilling for artesian water, it is reasonable to infer that the volume of water due to precipitation is materially increased by an underground supply. As some justification of this assumption, I may mention a spring which has its issue from the rocky rim just below the falls of the Miami river. Over the rocky ledge the dark brown water of the glade pours itself in a turbulent flood into the rapids of the Miami. But only a little distance below the falls, and exposed to view during the period of low water in the glade, the clear and uncolored volume of a huge spring gives itself up to the sunshine. The quality of the water is entirely different from that of the glades, and, as far as I have been able to observe, is unsurpassed in purity.

Approaching the glades from either east or west, the water gradually deepens, the rock forming the floor of the basin receding toward the middle at the rate of about 8.6 inches to the mile. In the valley thus formed, running north and south, the rock is about 15 feet below the surface. It is traceable directly across the glade, leaving no manner of doubt as to its persistence. Immediately over the rock is deposited the result of ages of decayed vegetation, forming a soft peat or muck, the depth of which varies from a few inches to five feet. It is everywhere present over the floor of the great basins, and if ever drained will afford a soil of incalculable richness and fertility.

For miles east and west from the valley of the basin and north

ON THE CALOOSAHATCHEE RIVER

and south through its length there stretches an almost impassable prairie of saw-grass. This saw-grass, rooted in the muck, grows to enormous size, and in many instances resembles a bamboo pole, of the size of an ordinary fishing-rod, with a continuous barbed-wire covering. On three sides of the grass grow teeth of singular sharpness, sometimes an inch in length. Through this prairie of saw-grass clear waterways are found here and there. Their direction is generally southward, and any attempt to cross the glades from west to east, as was the case with Mr Ingraham's expedition, is attended with great hardship and difficulty. Owing to the southerly trend of the glades proper, it sometimes became necessary for the members of the expedition, while carrying on their shoulders the camp outfit, to cling to the boats to prevent permanent bogging and an awful death in the sticky peat and ooze of the bottom. For the white man the passage of the glades means wading, poling, and portage, not infrequently through the densest of the grass, through which he sometimes has to blaze his way. The Indian, who has time on his hands, accommodates himself to the provisions of nature; he follows the path of the open waters and, through years of experience, has learned the apparently trackless way to his homestead or to the outside world. Frequently during Mr Ingraham's expedition the entire distance covered by a day of most arduous toil would not exceed 2½ or 3 miles. When night came on, nothing but saw-grass was in sight, and camp was made on the spot, the making of camp consisting merely in cutting away the saw-grass tops to a level, spreading out upon them the rubber blankets, and over these the clothing for protection and the cheese-cloth netting as a safeguard from sandflies and mosquitos. This somewhat uncomfortable mode of camping gave the party opportunities for observing and repeatedly verifying the marvelous growth of the everglade bamboo. It was frequently noted that the inner part of the cut grasses grew fully three-fourths of an inch during a single night.

Mosquitos are plentiful enough and sandflies exist in large numbers, but the greatest pest is the alligator-flea. This creature lives in the glade water, and has all the characteristics of his two namesakes. He is as strong as the alligator, as active as the *Pulex irritans* and his sudden sting has all the directness and keenness of that of the hornet. He is an oblong insect, brown in color, spongy in substance, and about three sixteenths of an inch in length.

For 8 or 10 miles on either edge of the glades the conditions change materially. Thousands of islands, varying in size from one-eighth of an acre to several acres, greet the eye. On these islands the soil is phenomenally rich, and giant ferns, the fronds of which measure 12 feet in length, grow upon their edges. The virgin forest is composed of the wild lemon, wild cucumber, and wild orange, the dogwood, the custard-apple, the prickly ash, and hundreds of other varieties. Overhead the myrtle and the morning-glory mingle in tangled masses with countless varieties of tropical vines.

In the early summer, after the annual overflow, the entry of the eastern region by the Miami river is singularly beautiful. Where a few weeks before the flood covered everything, is now a green prairie, and through the green gleam the delicate yellow and pink of numberless orchids. The emerald-hued islands are vocal with the songs of birds, and one can walk the now dry pathway of the waters, keeping time perchance to the diapason of some aged alligator bellowing away in a creek near by, unappreciated and undisturbed.

The great volume of water in the glades finds many courses to the sea. The northern basin empties its surplus into lake Okeechobee, from which it passes by the Disston drainage canal through lake Hicpochee and lake Flirt into the Caloosahatchee river and thence into the Gulf. In exceptionally wet seasons the northern basin overflows its southern rim, and contributes to the volume of the greater southern glade. These southern waters pour out through east, south, and southwest channels. Some portion of the volume doubtless furnishes the supply for the Big Cypress swamp. The remainder finds outlet through Gullivans, the Chokaluskee, the Fahkahnatchee, the Chatham, the Rogers, the Shark, the Harney, the Ingraham, and numerous smaller rivers and creeks. To the south there has not been sufficient exploration to furnish reliable data, but the Seminole tells of a southern outlet which is doubtless "Chi's Cut," and which furnishes the peculiar color of Black Water bay. On the east the outlets are numerous. Beginning with the Hillsboro river on the north, the great flood finds its way into the Atlantic through the Middle river, Cypress creek, New river, Snake river, Arch creek, Little river, and the Miami.

The islands in the Everglades have long been inhabited by the Seminole. His cypress dug-out follows the path of the waters from the outside world to his homestead. He lives in compara-

tive civilization. Choosing some specially high and fertile island, he clears away enough of the dense growth to make a garden. Here he grows bananas, sweet potatoes, and other vegetables. He is reasonably industrious and does his own work, leaving it only to hunt or to attend the symbolic dances of the tribe. For many years his chief support was derived from the sale of bird pelts and the growing of coontie, the arrowroot of Florida. But the one has been rendered illegal and the other unprofitable. His home is usually a somewhat crude hut, made of rough boards riven from the log, and covered with a thatch of palmetto. The women of the Seminole are treated as women, the rearing of the children and the cares of the household being their only labor. As the tribe is gradually diminishing in numbers, an abundant game supply is found in the water-bound reservation and in the Big Cypress swamp. Deer, bear, and the wild turkey are found in fair quantity, and countless herons and ducks have their perpetual home on the islands. The wild-cat and the panther also are found in moderate numbers, while the alligator is always in evidence, with now and then a crocodile. The fine array of venomous snakes of the early geographies is not to be found in the eastern glades, an occasional moccasin only appearing.

The average distance from the rim of the glades to the coast is: on the south and southwest about 15 miles, on the east about 6 miles, and on the west about 50 miles. West of the glades lie the Okaloocoochee slough and the Big Cypress swamp.

Southwest of the Big Cypress and south of the Everglades exploration is fraught with so many difficulties that the country remains to a large extent unknown. Along the greater rivers, such as the Fahkahnatchee, Harney, Rogers, and Ingraham, the land lies very low, a little higher usually on the south bank than the north. These banks are subject to overflow, continuing through a considerable period, during the spring. This makes the region practically unavailable for settlement. The banks of many of these rivers are covered with a growth of black and red mangrove, which grow here to the giant sizes, comparatively speaking, of 50 to 75 feet in height and 24 to 30 inches in diameter. When the mangrove is not present there is a dense hammock growth springing from a soil of wonderful richness, composed of muck with an underlying green marl, below which the ever-present limestone is found. Inside the hammock and next the rim of the glades is the usual prairie fringe. On the south coast of the peninsula there is almost no shore-line. The dense forests

of mangrove have reached out so far into the bays that the shoreline is merely an impenetrable tangle of roots. The weight of a man's body is enough to impart a swaying motion to three or four acres of this floating forest. Off the coast and extending to the northwest for many miles are countless islands or keys. These keys are covered with a dense growth of mangrove on the edges, while further in the sea-grape, wild fig, pawpaw, and buttonwood abound. On many of them there have been observed for years what appeared to be shell mounds, not differing in general appearance from other shell mounds. Through the narrow sun-kissed channels of these ten thousand islands the sponger, "the Conch," and the smuggler sailed for years; the settler in search of lands and the sportsman looking for a camp passed them by in contempt; but under the mangrove roots and the tangle of vines there slept the civilization of past centuries. These keys with their strange shell heaps are cities of the dead, and the magic touch of Mr Frank Hamilton Cushing has brought them into life. At Key Marco he has brought to light evidences of a culture belonging to the Stone age, yet surpassing it amazingly in beauty. Here dwelt a strange people who built sea-walls of shells and made themselves water-courts and temples on the gulf shore, working amazing results, in pottery and copper, with shark's teeth and fish-bones. How much more of this early civilization awaits re-search it is impossible to tell; but Mr Cushing's work has made the southwestern coast of the peninsula a shrine for the student and a mine of wealth for the worker in archeology.

It would hardly be possible to imagine in coast conditions a greater contrast than exists between these southern and southwestern coasts of Florida and the coast lying to the east of the Everglades. As one crosses the rim of the glades basin, the inevitable prairie is first met with. This is of varying width, but of remarkable fertility. Passing eastward it is succeeded by the pine-land belt, which in turn gives place to a hammock growth that is of its own kind. This new hammock fringes the inner shore of bay Biscayne, which, including Cards sound, has a shore-line of nearly 60 miles. To the utter surprise of the student of Floridian scenery and geology this shore-line is a rocky bluff. It is composed of a limestone yet unidentified, which, when first exposed, is soft and friable. It gives evidence of a slow, still-water bedding. Here and there it contains quantities of small shells; exposed, it weathers to a rich gray and hardens sufficiently to make excellent building-stone. In many localities

inland for a mile the rock is on the surface, but for the most part it is covered with rich vegetable mold. The hammock surpasses all others of Florida in the variety of its woods. The familiar wild mulberry, red bay, and liveoak are here. With them grow the wild fig or rubber tree, the gumbo-limbo, ironwood, mastic, naked wood, crabwood, and many others. Scattered along the rocky bluff, washed by the crystal blue water of Biscayne, are great numbers of wild lemons, limes, and oranges, and over them all from tree to tree climbs the vivid green of a giant vining cactus. It is here, too, that the cocoanut palm sends up its giant plume-like fronds. The bamboo transplanted makes itself at home. The century-plant, reckless of weather, bears its giant bloom, and the queen of all the trees, the royal palm, graceful beyond description, adds her luxuriance to the tropical beauty of the scene.

The rocky front of the inshore of bay Biscayne is broken by the Miami and other rivers flowing out of the Everglades. A little north of the bay, into New River inlet, empties New river. Both of these glade rivers are singularly beautiful. Their waters, clear and limpid, are fringed on either shore by all the wild growths of the hammock, until they make their way through pine and prairie, reflecting every change of scene like mirrors. Through these rivers the Indians come to the frontier to sell their skins and venison. The distance from the coast to the glades is from 6 to 8 miles, under the overlocking branches of trees that are always green. The fall of the Miami river as it leaves the glade is about 10 feet in 900. Its mouth fringed with lordly cocoanuts, the Miami empties into the bay almost due west of cape Florida. The southern extremity of key Biscayne forms cape Florida, not far from which is the northern end of the Great Florida reef.

South of cape Florida, here clustered and there widely separated by the opal waters of the Southern ocean, lies the great system of the Florida keys, beginning with Sands key, passing Cards sound, Barnes sound, and the bay of Florida, until in the extreme south Key West sits in her isolation, a city of over 20,000 inhabitants, cut off from her sister cities and compelled to be content with a mail twice a week. These keys are a study in themselves. They vary in size from a point of land to key Largo, which is 25 miles long and from one-eighth of a mile to 2 miles in width.

This fringe of the continent forms a safe barrier against the sea, and in land-locked waters the voyage from Miami to Key

West, whether in midwinter or midsummer, is full of comfort, charm, and beauty. The keys are not barren sand-wastes, as was at first supposed, but seem to be formed of the same rock as the bluff of Biscayne bay. They are tropical in plant life, genial in climate, and fertile almost beyond belief. The waters of this summer country are beautiful beyond everything that language or color can express. They are for the most part shallow, but in their greatest depths one sees through their crystal blue the underlying floor of bay or sound or strait. This floor is covered by sea-weeds in picturesque tangles and sponges of grotesque form, through and above which myriads of fish flit like flashes of electric light. Close by the shores the lazy shark glides along indifferent to your presence. The modest manatee, the strange sea-cow, hurries away to deeper water. From the opalescent surface the tarpon springs for his prey, the pompano for his pleasure. Overhead the sun shines brilliantly, but even at midsummer the trade winds blow so surely but so soothingly that there is no sense of heat and certainly none of oppression at any season of the year.

The fertility of the southeastern coast region is really beyond description. It presents a variety of soils and lands unequaled. Anything known to the north temperate zone, except wheat, will grow. The vegetables of the ordinary garden mature and ripen at any period of the year. Planting and gathering run side by side winter and summer. It is the natural home for all the citrus family, such as lemons, limes, oranges, citrons, grape fruit, and shaddock. The pineapple grows and yields almost without attention. Mangos, guava, the alligator pear, the sapodilla, the sugar apple, the Japan plum and persimmon, with numerous other tropical fruits, thrive and yield amazingly. The culture of vanilla, camphor, kola, cinchona, cinnamon, and coffee has begun with great promise of success. The eastern edge of the southern Everglade furnishes every condition of soil and climate necessary to the culture of the india-rubber tree, and, whether the glades are ever drained or not, the islands of their eastern edge will furnish the rubber of future commerce.

In this favored region frost is entirely unknown. In addition to its southern latitude, it has two potent protectors. Close to its eastern shore courses that nursing mother of the sea, the great Gulf stream. Westward the warm waters of the glades hang a mist veil for 50 miles. In the eastern islands of the glades the habit of growth shown by the trees proves that frost has never fallen.

THE SAGE PLAINS OF OREGON

By Frederick V. Coville,

Botanist of the U. S. Department of Agriculture

The states of Washington and Oregon are cut in half from north to south by a great mountain range known as the Cascades. By this climatic barrier the eastern portions of these two states are transformed into a great arid plain centering about the valley of the Columbia river. The eastern limit of the plain is the western base of the Bitterroot mountains toward the north and of other ranges belonging to the Rocky mountain system further south. Thus is formed a great wedge-shaped area, its base toward the south, where the plains are continuous with those of Nevada, and its apex toward the north, where the plain is finally shut in by the boreal forest-belt which connects the northern end of the Bitterroots with the northern end of the Cascades. Near the center of this triangle, in northeastern Oregon, rises a great, irregular mass of rock known as the Blue mountains, which projecting into the plain from the eastward almost divides it into two portions, the resultant plains area being roughly of the shape of a dumb-bell, the upper half lying in Washington, the lower half in Oregon, and the two connected by a narrow neck in the mid-northern portion of the latter state. The area is drained largely by the Columbia river, which has cut its way through the Cascades to the Pacific. In the southern portion of Oregon the streams in many places find no outlet to oceanic waters, but flow into alkaline lakes and marshy sinks, from which their water either percolates into the soil to find an outlet elsewhere or is evaporated into the dry atmosphere. In altitude the plains range from less than 500 feet along the Columbia river valley to 4,000 and even 5,000 feet in the more distant portions. From north to south in a direct line the extreme length of the plains is about 450 miles, from east to west in the northern portion about 150 and in the southern portion about 250 miles, the relatively narrow neck connecting the two being constricted in its narrowest part to not more than 15 miles.

The first white men to penetrate this region were those belonging to the expedition of Lewis and Clarke, who crossed the

Bitterroot mountains from the east in the summer of 1805 and traveled laboriously across the plains and then down the valley of the Columbia to the ocean. The subsequent history of eastern Oregon may be divided into the period of occupation by the Hudson's Bay Company and other fur-dealing organizations, then the period of gold-mining excitement, and finally the period of agricultural settlement, beginning with the Grand Ronde and stretching out to other less attractive localities.

Two decades ago the plains of eastern Oregon, south of the Blue mountains, were practically an unsettled region. It was then generally recognized that the country was capable of producing a good quality of beef in enormous amounts, and the available land was rapidly taken up, chiefly under homestead entries, so that now there remains little land worth entering. The country, however, is still very sparsely settled. Perhaps the most suggestive fact about the whole region is that no point in the United States lies further from a railroad than the center of this plain. Even the great desert from Death valley eastward across southern Nevada and Utah is more deeply penetrated by railroad lines than is this great wilderness of eastern Oregon. Traveling southward from the Dalles to the southern part of the state and then eastward into Idaho one can go more than a thousand miles without crossing a railroad track, although no point is more than about 100 miles in a direct line from some railroad connection.

In the year 1893 the Division of Botany in the Department of Agriculture began to make a comprehensive examination of the vegetation of these plains, beginning with the Columbia plains proper, in the state of Washington. In 1894 this work was continued southward across the Columbia through the neck of the dumb-bell and down nearly to the southern boundary of the state of Oregon. In 1895 the work was interrupted for more urgent explorations in the Coeur d'Alène mountains, but in 1896 it was again taken up and the remainder of the Oregon plains was covered. The collections made in these three years, though not confined entirely to the plains region, but including also some of the adjacent forested mountain country, contained not far from 1,800 species, and it is probable that the plains themselves, as distinguished from the forests upon the surrounding mountains, contain not less than 1,000.

This year the route followed was from the town of Ontario, on the Snake river, westward to Harney, from which place a side

trip was made northward in the Blue mountains. The expedition then traveled south from Harney to Steins mountain, then westward across the plains, winding back and forth between the north and south mountain ranges to Fort Klamath, and finally over the Cascades to the railroad.

The whole country appears to have been covered at some not very remote geological period by a great sheet of lava, which has since been cracked, uplifted, and depressed in various portions. Almost every plateau ends in an escarpment of naked basalt, known throughout the region as rim-rock, perhaps geologically the most characteristic surface feature of the country. Nearly every valley is inclosed by such a formation.

The vegetation of the country consists primarily of sage brush, the well-known *Artemisia tridentata* of botanists, a shrub three to six feet high, closely related to the wormwood of Europe, and having in common with that plant a light gray color and a strongly aromatic odor. Away from stream beds and sinks and the shores of lakes, sage brush covers the whole country like a gray mantle and constitutes probably nine-tenths of the total vegetation. It is a plant the herbage of which is eaten by but few animals and by those only in starvation times, one that will grow with little moisture and will stand the widest range of temperature. Sage brush gives to the country its character. A level stretch is known as a sage plain; the grouse which live there are known as sage hens; the fuel of the region is sage brush; the odor upon the atmosphere is that of sage brush.

After a season's lack of rain the sage brush turns to a blackish gray and everything has a dead, burned-out look, suggestive of thirst, of hot rocks, and parching winds. But after a soaking spring rain the sage brush puts on a new coloration, a delicate pale bluish green, soft and very pleasing to the eye. Occasionally in some far-off lava-covered basin of the plains, where there has been no rain for months, a stream bed stretching down from a mountain brings to the thirsty plain the water that has fallen in a summer thunder-storm upon some high peak, and as a consequence the dark gray blanket of sage brush is lighted up by a line of soft pea green. If the stream bed is one that still continues to carry water, the sage hens gather along it from miles back in the plains, and every morning and evening come down to drink. Sometimes the teal and other ducks, if the mountain is high enough to produce a perennial stream, bring up their broods of young in the tall grass along its margin. In one day's

journey of about 20 miles along such a stream we passed, by actual count, 389 sage hens and brood after brood of ducks, while at one point we started up, at a distance of half a mile, a herd of 20 antelope, which lined-up like Indians and trotted away from their drinking place over the rim of the plateau. They were doubtless on their way back to their grazing grounds, where even at the present stage of civilization no hunter ever disturbs them.

Regret is sometimes expressed that sage brush, abundant as it is, does not furnish a succulent, palatable herbage suited to the appetites of cattle and horses. If it did, what an inexhaustible supply of forage these arid plains would support. But those who suggest such a resourceful condition of affairs have forgotten that the cause of its abundance and wide distribution is undoubtedly the protection against the ravages of grazing animals afforded by its disagreeable taste, so that it can grow, produce its seed, and spread almost unchecked. Had it been a grazing plant, suited to the appetite of antelope and deer, and later to that of sheep, horses, and cattle, it would long since have been exhausted and the Oregon plains have become as bare of sage brush as some of the Wyoming plains are bare of grass.

A few other shrubs form an inconsiderable part of the woody vegetation, but these and the sage brush make up by no means all the plant life of the country. As the snow melts away in the spring, the well moistened soil between the Artemisia bushes becomes covered with the seedlings of innumerable annuals. For a few weeks the ground is carpeted with these plants, which flower in the greatest profusion, but after about two months they ripen their seeds, dry up, die, and disappear. Growing with these annuals is another type of plants, tuberous-rooted perennials, which have stored up during the preceding year's growth a large amount of nourishment. They therefore bloom at the first break of spring, go through a brief period of rapid growth, lasting usually a little longer than that of the annuals, and then the newly formed bulbs, well protected by impervious coats against the desiccating influences of a long, dry summer, carry over a full supply of plant food for the next spring's blooming.

At some points in the higher altitudes of the sage plains, in level or slightly depressed areas which catch and retain for a time some of the water from the melting snows in spring, a dense meadow of fine grasses, interspersed with the greatest profusion of brilliantly colored flowers, is formed, and as one of the most

abundant is the blue-flowered hyacinth-like camas, *Camassia esculenta*, these formations are known as camas meadows. They cover from a few acres to many hundreds. By the middle of summer these meadows, drained by some creek or rivulet, are dried out, the fine black soil, extremely sticky when moist, gaping open in deep, ragged cracks and becoming so hard that an ordinary spade makes scarcely any impression upon it. A lump of it broken off with a pick and cut with a knife shows a smooth, shining surface very similar to that of pipe-clay. When the soil of a camas meadow reaches this stage of dryness, the vegetation ripens, the seeds and dormant bulbous underground parts carrying the plants over the remaining period of drought.

As one descends from the open plains into the valley bottoms and approaches a lake or the sink of a stream, the soil becomes alkaline and the vegetation changes, the sage brush being followed by a somewhat similar hard-wood spiny shrub known as greasewood, *Sarcobatus vermiculatus*, and this, in turn, in case the alkaline valley bottom is dry, is succeeded by a hard-baked soil, absolutely devoid of vegetation. If the valley bottom is moist, the greasewood may be succeeded by a green carpet of salt grass, and this in turn by an incrustation of salt, often with a thin covering of briny water or oozy alkaline mud in the center of it. If, as frequently happens, the water in one of these valley bottoms is nearly fresh, it supports a more luxuriant vegetation, and the dense line of salt grass may be followed by taller succulent marsh grasses, the area covering hundreds and sometimes even thousands of acres and furnishing an almost inexhaustible supply of forage. In still wetter soil and surrounding the open water grows a line of tule, as it is called, a species of tall bulrush, known to botanists as *Scirpus lacustris occidentalis*.

At the western base of Steins mountain, in a great groove formed on the east by the sloping mountain base and on the west by an abruptly ended uplift of the lava crust, lie a long succession of marshes or slews, as they are called, connected by a flowing stream and covering probably a hundred thousand acres. This land constitutes the principal part of an immense ranch, consisting of 180,000 acres of fenced land, for the most part well watered. Indeed it covers all the available water supply of the region and controls a several times greater area of arid grazing land belonging to the government. In the spring the cattle are driven out into the open sage brush, where they graze for several weeks upon the abundant spring vegetation. Later,

as the dry summer begins and this transient forage supply is exhausted, the stock is driven higher upon the plateaus or the mountain slopes, where they find an abundance of bunch grass. Then, as the cold weather of autumn sets in and the snows begin, the cattle are brought down again to the marsh lands, and when the swamps are frozen over and the ice is sufficiently thick they are driven out upon it and there eat the air-dried sugar grass and cane grass and tules. Finally, forewarned of the opening spring by a warm chinook from the southwest, the Mexican vaqueros, or buccaroos, as they are more commonly called in the language of the Oregonians, clear the cattle off the ice before it finally breaks up. Every summer an immense amount of hay is secured from these great meadows, about three thousand tons being annually cut and stacked for winter use on this particular ranch. During the storms of winter the cattle on the ranch are, as far as possible, fed and sheltered, but heavy losses from freezing and starvation frequently occur.

In 1889–'90 occurred one of those long, hard winters which are expected in eastern Oregon perhaps once in ten years. Snow began to fall earlier than usual and continued almost incessantly throughout the winter. The stock caught out upon the range were wholly inaccessible and could not be brought into the corrals. The cattle that were under shelter at the time the conditions became serious were fed as long as the supply of hay lasted, and then, the spring not breaking at its accustomed season, the animals slowly starved. The loss by starvation in the entire region varied from 30 to 70 and even 90 per cent. Those stock-raisers who were well prepared for such an emergency escaped with a set-back of a year or two in profits, but those who were taken in the worst condition were in many cases ruined.

The Indians who once lived upon these plains found, through centuries of slowly-gathered experience, not only that they could exist, but that they could live in comfort, building themselves shelters of tules and of juniper brush, and easily obtaining an abundant supply of game and rich, nutritious food with all the articles necessary to the manufacture of their various implements, their clothing, their cooking utensils, and in fact all the other necessaries of an out-door existence and the luxuries of savage life.

Perhaps no Indians in the far northwest have been guided by better councils from their chiefs, have shown a greater desire to assume the conditions of civilized life, or have proved them-

selves more capable of development under those conditions than the Klamath Indians of Oregon. They are now gathered together upon a reservation, about 40 miles by 60 in extent, in the southwestern part of the Oregon plains, in a country partly forested and partly covered with sage brush. The land they occupy is a part of that upon which their ancestors lived, and thus, not having been removed from the conditions under which they developed, they furnish an excellent opportunity for observing an intelligent Indian tribe, in process of civilization, still retaining the best and most deeply rooted of their old customs and habits and substituting for the less useful ones the improvements of civilization, yet not giving up in a generation the old tendencies of centuries. These Indians graze cattle and horses, cut hay for winter use, and raise a small quantity of grain and occasionally a few vegetables. They build fences around their separate farms and are now building houses of sawed lumber, their blacksmiths, carpenters, shoemakers, and other artisans being educated at the agency schools.

At least a hundred species of the native plants of the region are still used by the Klamaths in one way or another. One of their staple farinaceous foods is the seed of the great yellow water-lily of the northwest, *Nymphæa polysepala*, which grows in inexhaustible quantities in the marshes of the reservation. The bulbs of the camas plant, of which enormous amounts are pried out of the ground in spring with a camas stick or digger, furnish another excellent and favorite food. The most important of their fleshy fruits is a huckleberry, *Vaccinium myrtilloides*, which covers the mountain slopes in some parts of the neighboring Cascades. The best of their fibers is a perennial blue-flowered flax, *Linum lewisii*, which grows without irrigation in the open sage brush at higher altitudes. They get a beautiful lemon-yellow permanent dye from a yellow lichen, *Evernia vulpina*, which grows abundantly on the trunks of trees in the pine forests. Some of these plants and others equally useful may well attract the attention of agricultural experimenters.

In view of the present agricultural depression, which appears to be especially severe in the plains of eastern Oregon, the question naturally arises what the future promises in the way of relief; whether the agricultural capacities of the region are such as to offer a fair prospect of relief by some modification of the prevailing system or whether the result must be the gradual abandonment of present settlements. This is notably one of

those regions in which money is made out of only one product, in this case, forage. The forage crop is not immediately exchanged for money, but is used to fatten cattle for beef, to raise horses for farm and other purposes, and to grow sheep for wool. At present the low price of wool has practically put an end to sheep grazing. The low price of horses, as draft animals, has resulted in the inability of the ranchers to market their stock, horses fresh from the range being now worth in some parts of Oregon no more than five dollars per head. The actual products of the region, therefore, are essentially limited to one, namely, beef cattle, and the price of these is so low that the income is barely sufficient to pay the expenses of managing the ranch.

One practical modification of the present system is clearly apparent to the traveler. Ranchers have been accustomed under the high prices of former years to neglect the ordinary processes of farming and to purchase their entire food supply from the outside, paying not merely the first cost of the food in eastern markets, but the cost of railroad transportation and of a long wagon haul besides. The ranchers of the plains have assumed rather than proved by experience that the country is incapable of producing the ordinary farm crops, such as are necessary for family use. There is no question that a proper use for gardens and field crops of some of the water which now either goes to waste or is turned upon grazing lands would be a most important step toward bettering the present agricultural conditions. This lesson, indeed, is now being learned practically from force of necessity, and in many places where it has been assumed from the occasional early or late frosts that certain crops could not be grown it is now found that with proper foresight and care excellent crops are produced.

Another lesson to be drawn from the fact that the native races obtained an abundant subsistence from these same plains in which a civilized race now finds it hard to subsist is that it is impossible to carry on with success in an arid region an agriculture developed in a humid region, unless important modifications are introduced. This lesson has already been learned in some other parts of the country, as, for example, in western Kansas, in Indian territory, and in northern Texas, where after years of largely unsuccessful trials it was found impossible to depend upon the typical American stock feed, Indian corn, but it was found possible to grow a cereal of the old world, now commonly

known as Kafir corn. This has been found to flourish under conditions too arid for Indian corn, to produce heavy crops, and to have about the same nutritive qualities as that product for feeding farm stock of all kinds or for human food. There is a great subarid belt in that region in which Kafir corn has now become the staple crop, and while there is no great demand for it in the markets of the world, and it is not, therefore, directly convertible into money, yet, when transformed into pork, beef, or draft animals, it brings quite as good a price as Indian corn. Though this particular crop is probably not suited to the plains of Oregon, it suggests strongly that there may be equally valuable plants well adapted to that region. The observations we have just made on the native plants demonstrate the fact that there are many food-producing species which stand the climate well, and there is a reasonable probability that some of them might by careful cultivation and selection be turned into useful agricultural products. The bringing about of such a result, however, can be the outcome only of long and laborious experimentation and it offers no immediate solution of the present problem.

There is one phase of wastefulness of the natural resources of the United States which a trip across the plains of Oregon particularly impresses upon the traveler, namely, the careless destruction of our great natural wealth of forage. It is doubtless to this that the local aggravation of the present agricultural depression is in some parts of the country due. After an educational campaign of twenty years the government has recently appointed a commission to report a practical plan of dealing with the forestry problem of the United States. From the condition of our great grazing areas in the west it seems probable that the time will come when a similar popular demand will be made upon the government for some means of preventing the exhaustion of the forage supply on the public lands. Continued over-grazing year after year, if sufficiently excessive, unquestionably kills out the native forage plants, which are then replaced largely by introduced weeds. The original nutritious grasses never regain their former luxuriance and sometimes are almost exterminated. Under moderate grazing the native species produce yearly a good crop, or if even slightly over-grazed will after a few years of rest regain their former abundance.

Only a comparatively small percentage of the arid grazing lands of the west are under private ownership. Most of the

grazing is done upon the public lands. When the price of beef or other product of grazing was high, as it was, for example, ten years ago, it was to the immediate interest of every cattle owner to fatten the largest number of stock in the briefest possible time, regardless of the effect of so doing upon the future productiveness of forage. Not only is the system a bad one theoretically, but its practical effects are manifest in the actual conditions of many portions of our grazing regions today, and if the prices of the products of grazing continue high enough to make grazing a profitable industry, the condition of affairs is bound to become gradually worse, and we shall ultimately, in section after section, ruin our grazing lands.

The correction of the evil may be brought about, it seems to me, by one of three methods. First, by a system of licenses which shall regulate the number of cattle to be grazed on a given area. A similar system has been proposed for our forest lands, and some plan of the kind seems likely to be adopted. The principal objection to licenses in the case of grazing lands is that the responsibility of the government would be great and the administration of such a law would add enormously to the machinery of the executive.

A second and perhaps preferable method is the private ownership of land. It is evident that it is to the advantage of an owner to maintain his land at its greatest continued productiveness, and he would not, therefore, seriously over-graze it. As a matter of fact, the great cattle ranges, which are either owned by individuals or corporations, or are essentially theirs through the control of the available water supply, are in far better condition today than the public lands, which are common grazing grounds, and many of the areas thus controlled are in just as good condition as they ever were.

A third method of securing responsible management of grazing lands is a long-term lease from the government. The principal objection of cattlemen to private ownership of land is the necessity of paying taxes. This difficulty would be obviated by a lease of the land from the government, and, even though the amount paid were small, the advantage of an interested management would prove of the highest benefit to the general public, while the government would still retain its title to the land and after the expiration of the lease could make new terms, based on longer experience and changed conditions.

THE UNITED STATES DEPARTMENT OF AGRICULTURE AND ITS BIOLOGICAL SURVEY

Probably no investigations now being carried on in connection with the many-sided scientific work of the U. S. Department of Agriculture will be more productive of beneficial results than those which are being conducted in the Division of Biological Survey, under the direction of Dr C. Hart Merriam. Six years ago Congress authorized the Department to institute a comprehensive investigation of the geographical distribution of plants and animals, but it made no change in the official designation of the division—that of Ornithology and Mammalogy—to which this important work was to be assigned. At the last session of Congress, however, this omission was made good, and now the study of the distribution of life in the United States with reference to the adaptation of different sections of the country to different agricultural and horticultural products will no longer be even nominally subordinated to those less important though most useful investigations in which Dr Merriam and his collaborators have hitherto been mainly engaged.

During the last half-dozen years American agriculture has been passing through a period of transition, consequent in part upon a sudden shifting of the agricultural center of gravity and in part upon an unusually prolonged era of low prices. It has been a time of change and experimentation, and millions of dollars have unquestionably been wasted through ignorance of the complex relations of the different products of the soil to the conditions under which their growth to maturity can most effectually be promoted. Although, with the exception of the cotton plant and the West India sugar cane, all the principal agricultural products of the United States have come, through the adaptation, either natural or artificial, of one or another of their varieties to local conditions, to have a range of successful cultivation almost as far-extending as the country itself, there is not one of them, nor a single variety of one of them, that has not an area within which its yield is more certain, more perfect, and more abundant than it is anywhere else, and this area is as definitely ascertainable as is the geographic distribution of the humming-bird or the long-leaved pine. To discover these regions of

ideal conditions—of perfect adaptations—and so to understand their essential relations, each to its particular product, that the result of the slightest departure therefrom can be accurately foretold constitutes one of the principal duties of the new division.

The distribution of cultivated products cannot, however, be restricted to the localities in which the conditions of growth are exclusively favorable, and it may be presumed therefore that we shall see not merely a definite localization of the various regions of perfect development, but also an exact graduation of the manifold conditions of all reasonably successful cultivation.

A natural complement of these important investigations will be the introduction of new species of economic plants from abroad and their allocation to congenial climates and suitable soils, a procedure that will open up enormous possibilities of usefulness in a country possessing so great a diversity of soil and climate as does the United States.

All this, however, will call for the exercise of scientific attainments of the highest order, and its accomplishment will be a work of years. It is to be hoped that neither changes of administration nor mutations of congressional majorities will interfere with it, but that its maintenance will be as liberal and uninterrupted as befits an investigation of such vast economic importance.

J. H.

STATISTICS OF RAILWAYS IN THE UNITED STATES

From an advance copy of *Statistics of Railways in the United States*, from the report of the Interstate Commerce Commission for the year ending June 30, 1895, it appears that the total railway mileage of the country at that date was 180,657 miles, an increase during the year of 1,980 miles, or 1.09 per cent. This is the smallest annual increase for nearly a generation. It is, however, very generally distributed over the country, being participated in by nearly every state. As to railroad equipment, the number of locomotives has been increased by 207; the number of passenger cars also shows a slight increase, but the number of freight cars in use has been reduced by 9,050. The number of railroad employés was 785,034. This is a trifle larger than in 1894, but is a great reduction from the preceding year, when high-water mark in railroad transportation was reached. The reduction is quite uniformly distributed among all the different classes of employés. It is a notable fact that while the pay of the officers and clerks of railway corporations has been materially reduced during the recent depression, that of other employés remains practically the same as at its commencement. The total amount of railway stock stands at nearly 5,000 million dollars, and the total indebtedness is 4,041

millions, both showing a slight increase over the preceding year. As to public service in transportation, the total number of passengers carried was 507 millions, or, to put the figures in another form, the number of passengers carried one mile was 12,188 millions. This is a decrease from the preceding year of 1,200 millions, showing the extent to which the depression in business has affected the migrations of the people. On an average, every man, woman, and child in the country traveled by rail a distance of 175 miles during the year. The number of tons of freight moved was 697 millions, the number moved one mile being 85,227 millions, an increase of 4,882 millions over the preceding year. The gross income of the railroads was 1,075 million dollars, an increase of two millions, and the net income 350 millions, an increase of 7.7 millions. The dividends declared during the year amounted to 56 millions, or about 1.1 per cent on the capital stock. H. G.

GEOGRAPHIC WORK IN PERU

In several of the South American republics there are flourishing geographic societies. There, as in Russia and a few other countries, the geographic organization is a nucleus of general scientific activity, and geography becomes the foster-mother of various sciences, including geology, mineralogy, meteorology, botany, zoölogy, archeology, ethnology, etc. This is eminently true of the "Sociedad Geográfica de Lima," the leading scientific society of Peru. Its active membership is large, vigorous, and widely distributed, including many of the best known professional men and civil and military officers of the country. The *ex officio* president is the President of the Republic, and the *ex officio* vice-president is the Minister of Foreign Affairs; the present president of the council is Dr D. Luis Carranza, F.R.S., a widely known publicist, and the secretary is Dr D. Federico Elguera, kinsman of a diplomatic official favorably known in Washington. The honorary membership includes several active members of the National Geographic Society. The society issues a "boletin" of which the third trimester of the fifth volume has recently appeared; its contents indicate the breadth of the field occupied by the society. The opening article is the itinerary of Raimondi—"El inmortal Raimondi, creador de la Geografía Peruana," as he is styled by a leading Peruvian geographer—among the mountains of Huancayo in 1866; the second article is an exposition of a graphic method of determining latitudes and meridians; the third is the report of the delegate to the sixth International Geographic Congress in London; then follows a list of the common and systematic names of Peruvian plants. Sixteen pages are devoted to a description of Peruvian hydrography, and there is a classic contribution to the knowledge of aboriginal linguistics occupying forty-two of the large octavo pages. A brief account of the Victoria regia, "la reina del Amazonas" follows, and the fascicle closes with a series of elaborate meteorologic records, including the official tables prepared by the National Academy of Medicine.

GEOGRAPHIC LITERATURE

The Scenery of Switzerland and the Causes to which it is due. By Sir John Lubbock. New York: Macmillan & Co. 1896.

Two critics of this one book have said: "Had not this volume borne a well-known name we should have guessed it to be the production of one or more geological students who had read too many German text-books, and mixed their notes with . . . brief and simple extracts from the diary of a Swiss tour" (London *Athenæum*, Aug. 1, 1896); and "This admirable book shows how thoroughly a sagacious amateur may follow, appreciate, and transmit to a large circle of readers the best physiographic results gained by geologists and geographers of Switzerland" (*Science*, Aug. 7, 1896). As the latter opinion is my own, I naturally prefer it to that of the London writer, who seems to me a carping critic, unsympathetic and unappreciative. He gloats over misprints, he dwells on mistakes of *de* for *du*, he magnifies other trifling inaccuracies, and thus fails to present to his readers a clear idea of the intention of the book and of its essentially successful accomplishment. As it seems to me, the real point of the book is this: instead of contenting himself, after the fashion of the typical Alpine clubman, with a merely athletic ascent of a mountain peak, in itself truly fine and invigorating exercise, Lubbock has done much more, for he has studied as well as climbed, and the book is an effort to share with others the intellectual entertainment thus gained. As he says: "My attention was from the first directed to the interesting problems presented by the physical geography of the country. I longed to know what forces had raised the mountains, had hollowed out the lakes, and directed the rivers. During all my holidays these questions have occupied my thoughts, and I have read much of what has been written about them." Speaking of the plan of his book, he adds: "I urged Tyndall and several others far better qualified than I am myself to give us such a volume, feeling sure that it would be welcome to our countrymen, and add both to the pleasure and to the interest of their Swiss trips. They were all, however, otherwise occupied, but they encouraged me to attempt it, promising me their valuable assistance, and this must be my excuse for undertaking the task, perhaps prematurely."

The book is a very welcome contribution to popular scientific literature, and the more so because it is upon a subject that has called forth singularly little writing of this class, in spite of the rich variety of its materials. It gives a brief account of the geology of the Alps, of the origin of mountains in general, and of the structural features of the mountains of Switzerland in particular; then follow chapters on ice and glaciers, on rivers, valleys, and lakes, and on the influence of the strata on scenery. Nearly two hundred pages ensue on special districts of the Alps, such as the Jura, the central plain, Mt Blanc, the Bernese Oberland, the Rhine, the Reuss, and the Engadine. Nowhere else can the intelligent reader or observant

traveler so readily gain a general view of the results attained by specialists. One may amusedly regret that snow is spoken of as having eight-sided crystals (p. 56), and at the same time enjoy the account of avalanches and of moraines, which will surely edify many an inquiring traveler. Perhaps two names, *Sallanches* and *Salanfe*, are confused; but where else shall we go for a simple and accessible English rendering of such studies as Heim's on the former course of the Rhine or the beheading of the Inn? As a consequence of the latter accident, four little lakes have been formed on the valley floor, barred by alluvial fans thrown out by the lateral streams. Here is the best example that can now be quoted of this peculiar species of lakes; yet the *Athenæum* critic will have it that they are not caused "by dams formed by lateral streams, but by the rocky barriers above and below the lake of St Moritz. Lateral streams have only divided in two places the upper lake." Having a particular interest in lakes of this class, I wrote to Professor Heim, of Zurich, for fuller particulars, it being from his original study that Lubbock took his account. In reply, Heim gives details confirming his original statement and justifying Lubbock's abstract of it. A valuable list of works and authors referred to is given in an appendix. An index is unfortunately wanting.

One of the chief values of Lubbock's book lies in its being so manifestly the work of one who has enjoyed the study and observation required in its preparation. The author may still spell *Chamonix* "*Chamouni*;" perhaps, as a very busy man, he may leave proof-reading to others (we hope he gives his own time to higher pursuits), but he certainly shows himself a generous man in taking the pains to make so accessible to many others the beauties of nature that he has himself appreciated so well.

W. M. DAVIS.

Frye's Home and School Atlas. Boston: Ginn & Co. 1896. $1.15 by mail.

This is a by-product of the Frye series of school geographies. It contains 24 geographic maps, 9 of which are devoted to the United States and 10 to other parts of the world, the remainder being historical and commercial. These are well indexed and are convenient for ordinary use, although upon very small scales. There is also a series of relief maps of the continents and principal countries, and the work concludes with climatic and industrial maps of the United States, with descriptive text, tables, etc.

Lakes of North America: A Reading Lesson for Students of Geography and Geology. By Israel C. Russell, Professor of Geology in the University of Michigan. Pp. xi + 125, with 32 illustrations. Boston: Ginn & Co. 1895.

This little book is a treatise on lakes, in the light of the new geography. It classifies lakes by the origin of their basins, as those due to atmospheric, aqueous, glacial, volcanic, and other agencies. It treats of the movements of lake waters, as tides, waves, and currents, the effect of lakes upon climate, and the flow of streams. It describes the characteristic topography of lake shores, as cliffs, terraces, banks, deltas, etc.; the character-

istics of fresh waters and saline lakes are given, life histories of lakes are detailed, and the book closes with studies of certain lakes, living and extinct, including the Laurentian lakes, lakes Agassiz, Bonneville, and La Hontan. The book is an exceptionally fine contribution to the science of physiography. It is delightfully written and the illustrations are in keeping with the matter of the work.

PROCEEDINGS OF THE NATIONAL GEOGRAPHIC SOCIETY, SESSION 1896-'97

Special Meeting, October 30, 1896.—Vice-President Merriam in the chair. Mr Frederick V. Coville read a paper on the Sage Plains of Oregon, illustrated with botanical specimens and lantern-slide views.

Special Meeting, November 6, 1896.—President Hubbard in the chair. Hon. Willis L. Moore addressed the Society on Weather Forecasts and Storm Warnings. Typical weather maps were distributed among the audience.

Regular Meeting, November 13, 1896.—President Hubbard in the chair. Mr George K. French lectured on the Gold Coast Colony: a Visit to Ashanti and Kumassi, illustrating his address with lantern slides.

Special Meeting, November 20, 1896.—President Hubbard in the chair. Col. Charles Chaillé-Long, late of the General Staff of the Egyptian Army and Chief of Staff to Gen. Gordon Pasha, Governor General of Egyptian Sudan, delivered an address on Egypt and her Lost Provinces, with an Account of the Recent British Expedition to Dongola and Khartum. A large map of Africa and a number of lantern slides were exhibited.

Regular Meeting, November 27, 1896.—Vice-President Merriam in the chair. Judge Emory F. Best, Assistant Commissioner of the General Land Office, read a paper on the Utilization of the Vacant Public Lands, illustrated by maps and diagrams.

Elections.—Now members have been elected as follows:

October 30.—F. N. Barber, P. A. Eng'r F. C. Bieg, U. S. N., L. C. Brown, Chief Eng'r A. B. Canaga, U. S. N., Miss M. C. D. Chenoweth, Hon. E. S. Converse, Mrs Mary R. Davis, Mrs George M. Davison, George Doolittle, Miss Laura L. Dorsey, Miss Frances S. Fairley, Miss C. L. Garrison, Rev. Alfred Harding, Wm. C. Hobbs, Rev. J. N. MacGonigle, Miss Jeannette McWilliams, H. C. Oberholser, Edward A. Preble, Miss E. G. Reveley, Mrs M. J. Seymour, Dr Z. T. Sowers, Mrs E. A. Sutphen, Philip A. Tracy.

November 13.—Peter Bisset, G. L. Bouton, Miss Grace Calkins, Capt. H. M. Kendall, U. S. A., Frank B. King, Adam R. Magraw, F. E. Mitchell, D. P. Nicholson, Mrs Albert M. Patterson, Dr Paul J. Robert, B. D. Stallings, E. J. Todd, Edward White, George R. Williams, Miss Hattie P. Wood, Prof. Albert A. Wright.

GEOGRAPHIC NOTES

ASIA

JAPAN. Arrangements are being made for a direct line of steamers to run between Japan and the Black sea ports.

SIBERIA. The West Siberian Railway has been brought into direct communication with the principal railway systems of Europe.

The expedition sent out by the Russian Geographical Society for the exploration of the Irkutsk region will be absent three years.

AFRICA

TRANSVAAL. The final count makes the population of Johannesburg, according to the recent census, 102,078. Of the 50,907 whites, only 6,265 were born in the Transvaal.

EGYPT. The reimbarkation of the Indian troops for Bombay disposes of the statement that the Anglo-Egyptian army would soon continue its march southward beyond Dongola.

Up to the end of 1895 900 miles of agricultural roads were completed. The construction of a system of light railways for the transportation of agricultural produce has also been authorized.

NATAL. The revenue for the fiscal year 1894–'95 was £1,169,780, and the expenditures £1,148,093. In a recent lecture at the London Imperial Institute, Professor Crookes stated that the colony of Natal contains more coal than existed in Great Britain before a single ton was raised.

TUNIS. After fourteen years of French occupation Tunis contains only 3,000 French inhabitants, as compared with 7,000 Maltese and 8,000 Italians. The colonizing efforts of the government have been attended with but little success, but French rule is regarded as being in the main beneficial.

AUSTRALASIA

NEW SOUTH WALES. During the recent session of parliament some slight amendments were made in the land laws, with a view to further facilitating the settlement of the colony, which is said to be making remarkable progress.

VICTORIA. During the last three years the city of Melbourne has lost 40,000 of its population, the prosperity of the agricultural industry of the colony affording superior attractions to the pursuits of the capital city.

The colony of Victoria has shown remarkable energy in opening up an extensive export trade with Great Britain. The colonial government has practically assumed control of the trade, and its contracts with two of the principal lines of steamers enable shipments to be made at extraordinarily low rates, the charge for butter, cheese, and meat being only 1½

cents per pound for the voyage from Melbourne to London in cold storage. The butter shipments to London from this single colony last year were close on to 20,000,000 pounds, valued at $5,406,215.

West Australia. Intelligence has been received of the arrival at Fitzroy river, in the northern part of West Australia, on November 6, of the expedition which left Adelaide in May last for the exploration of the interior of southern and western Australia. Two members of the party are missing and the survivors suffered great hardships and had to abandon their effects and scientific collection.

POLAR REGIONS

Antarctic. July 15, 1897, is the day fixed for the starting of the Belgian Antarctic expedition. The voyage is expected to be completed within two years, but a three-years' supply of provisions will be taken. The steamer, *The Belgica*, will go first to the east of Grahams Land in George IV sea, and then winter in Australia. The second year will be devoted to Victoria Land. The steamer will be well equipped for scientific investigations as to marine specimens and submarine deposits.

MISCELLANEA

The resources and attractions of the far west could hardly be more interestingly and at the same time more fairly set forth than is done in *The Corn Belt*, an illustrated monthly publication of the Chicago, Burlington and Quincy Railroad.

The heated term from July 28 to August 17 last is stated by Prof. H. A. Hazen in the *Monthly Weather Review* for August to have covered a larger region and given abnormal heat on a greater number of consecutive days than ever before recorded.

Always full of good things, thoroughly up to date, and for the most part admirably illustrated, *Knowledge*, published monthly in London, deserves to be better known in the United States than is indicated by its somewhat rare appearance in our libraries and newsrooms.

Boletin del Instituto Geológico de México, number 3, by Dr Carlos Sapper, is devoted to the geology and physical geography of Yucatan. It includes chapters on the agricultural and mineral production of the peninsula, and a valuable supplement containing meteorological tables and the elevation of 393 principal points in the province described.

Four hundred Illinois teachers attended the course of lectures on Physical Geography recently delivered at the University of Chicago by Professor Albert Perry Brigham, of Colgate University. The lectures were practically limited to the illustrative study of land forms, but the audience was led from definitions and elementary principles to the relation of physical geography to history and to industrial development in a manner that must have proved as delightful as it was instructive.

AN IMPROVED METHOD OF KEEPING THE SCORE IN

DUPLICATE WHIST, COMPASS WHIST, STRAIGHT WHIST AND EUCHRE.

Since Duplicate and Compass Whist have come into fashion there has been an unprecedented revival of interest in the game, due to the fact that mere *luck* is to a large extent eliminated by a comparison of the scores made in the play of the same hands by different players.

The one thing needed to perfect the new method has been a convenient device by means of which the score made on the first round can be concealed until after the replay of the hands, as a knowledge of the first score often enables a good player to make a decisive gain, and matches are lost and won on just such little chances.

A Washington player has at length invented and put upon the market at a very low price a little device which admirably answers the purpose, and at the same time serves as a pretty and useful table ornament, marker, and pencil rest. It is called the "Cosmos Counter," and consists of a little polished wood tablet with a metal keyboard that can be clamped down on the score in such a way as to bring 24 little metal plates over the 24 spaces in the "score" column of the card, for use in concealing each first score as soon as recorded and until the hand is replayed (in duplicate whist) or the entire series finished (in compass whist).

Whist players will at once see the advantage of this new method of keeping the score, as it effectually prevents their opponents at the same or another table from taking advantage, either by accident or design, of a knowledge of what the hand is capable. The trouble with duplicate whist, especially, is that the replay is liable to be influenced by memory of the cards and score, and anything that helps to confuse such recollection is a great gain to fair play.

The "Cosmos Score Card," prepared for use with the counter, shows several new features, such as a heading for both Duplicate and Compass Whist and (on the reverse) for Straight Whist, Euchre, &c., thus enabling the same counter and score to be used for any game of cards.

Cosmos Counters, with tablet of quartered oak, maple, or birch, and metal in either gold or silver finish, 50 cts. apiece; 5 for $2.75; 12 for $5; by mail, 4 cts. apiece extra. Cosmos Score Cards, 25 cts. per package of 50; 12 packages for $2.50; by mail free of postage.

Ask to see samples at any stationer's, or order direct from the General Agents.

Cosmos Duplicate Whist Score

N | E

S | W

HAND	COMPASS WHIST SCORE	COMPASS WHIST TOTALS	COMPASS WHIST TRUMP	COMPASS WHIST OPPONENTS	DUPLICATE WHIST SCORE	DUPLICATE WHIST GAIN	DUPLICATE WHIST TRUMP	DUPLICATE WHIST GAIN	DUPLICATE WHIST SCORE	HAND
1										1
2										2
3										3
4										4
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The Negro Republic of Africa and its Homes,

FROM PERSONAL OBSERVATION,

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