Number 2

Engineer Historical Studies

Explorer on the Northern Plains:

Lieutenant Gouverneur K. Warren's Preliminary Report of Explorations in Nebraska and Dakota, in the Years 1855 - '56 -'57

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Introduction
by
Frank N. Schubert

Historical Division
Office of Administrative Services
Office of the Chief of Engineers

FOREWORD

This is the second publication in the new series of Corps of Engineers Historical Studies. Like the first, it features the report of an Engineer explorer. Unlike its predecessor, it reproduces a once-published narrative, one that frontiersmen heading into the Dakota country to pan for gold used as a guidebook.

Warren's report presents the northern plains from a variety of perspectives. On his first exploration, he accompanied a military expedition against the Sioux. The second time, he reconnoitered major streams from the decks of river boats. On his last trip, he rode into the heart of the Black Hills homeland of the Sioux. From data acquired on these journeys, he wrote his narrative with its details about the land, its fauna and flora, and its people. Warren's report captures for all time the northern plains at an early stage of settlement. It also illuminates the role of the Corps of Engineers in westward expansion.

J. K. BRATTON
Lieutenant General, USA
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ACKNOWLEDGEMENTS

No matter how small the project, success depends on the cooperation and assistance of many. Among those who read the introduction and made helpful suggestions were my colleagues Dale E. Floyd and John T. Greenwood; William G. Bell, Kim B. Holien, and Brooks E. Kleber of the U.S. Army Center of Military History; and James A. Hanson of the Smithsonian Institution. Jim Hanson knows as much as anybody about Warren and the northern plains, and I learned a great deal from our conversations over the past several months. Research and acquisition of pictures and maps were made easier by John Dwyer, Center for Cartographic Archives, National Archives; Leigh G. DeLay, Nebraska State Historical Society; Margaret Combs of the Historical Division; and Ann P. Crumpler, U.S. Army Corps of Engineers Library. Cynthia A. Barnes typed the introduction. Edward J. Miller, Henry Born, Edward Braun, and Ted Smallenbroek managed and carried out design and production.

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Washington, D.C.

INTRODUCTION

Early in October 1851, a very young second lieutenant in the Corps of Topographical Engineers sat at his desk in Philadelphia and wrote to his father. Slim, black-haired, and moustached, with a penetrating gaze that became somber as the years passed, Gouverneur K. Warren pondered his future. He had graduated second in the Military Academy's class of 1850 and already had a reputation for uncommon intelligence. In fact, rumors circulated about his return to West Point as a mathematics instructor. While flattered by the gossip, Warren hoped to avoid such an assignment, at least for a while. As he confided to his father, "I would rather rough it than be sent there before hard service had made me above reproach."[1]

Warren soon had the field work he craved. Like other members of the small, elite Corps of Topographical Engineers, he became involved in an expanding program of navigation improvements. After two years as an assistant engineer on the topographical and hydrographical survey of the Mississippi Delta, he worked for Colonel Stephen H. Long on the canal around the falls of the Ohio River at Louisville. From there he moved to the upper Mississippi, where he took charge of the surveys for improvement of Rock Island and Des Moines rapids. By 1855 he had honed his abilities with four years of practical experience.[2].

In 1855 the nature of Warren's duties changed dramatically. America's attention focused more than ever on the vast region west of the Mississippi River. The huge southwestern domain obtained after the Mexican War, the twin fevers for California gold and Oregon farmsteads, and the political debates over a railroad route to the Pacific coast meant important work for the Topographical Engineers. Exploring parties examined the new country, reported on its resources, surveyed wagon roads, and led expeditions over proposed railway lines across the plains and mountains. Assigned to compile a map of the trans-Mississippi West in the Office of Pacific Railroad Surveys, Warren began to play his part in the great westward movement.[3]

The widespread interest in the new country joined with more specific developments to shape Warren's role. In a drama played out on the banks of the North Platte near Fort Laramie in August 1854, an irate emigrant, a wandering cow, and a green second lieutenant

Gouverneur K. Warren. *Nebraska State Historical Society.*

sparked a conflict that later took Warren beyond the Father of Waters into the hunting grounds of the Sioux. The emigrant was one of a large number of Mormons bound for the Great Salt Lake and the haven first pointed out to Brigham Young in the reports of Lieutenant John C. Frémont of the Topographical Engineers. The Mormon emigrant owned the cow, until it strayed and ended its life in Indian cook pots. After the owner found out about the cow's demise, he complained to First Lieutenant Hugh B. Fleming, who commanded Fort Laramie. Fleming ordered Second Lieutenant John L. Grattan to capture the Indian miscreant, a Miniconjou Sioux warrior who was a guest in a Brulé Sioux camp. His hosts would not surrender him, so Grattan unlimbered a small artillery piece and opened fire. The Sioux cut down the young officer and twenty-eight of his twenty-nine men. One wounded soldier made it back to Fort Laramie with the awful news before he too died.[4]

The tragic affair, which quickly became known as the Grattan massacre, had wide repercussions. The fire fight in the Brulé camp was, as historian Robert Athearn observed, "like a rock thrown into a pond." As the ripples widened, the relative calm on the northern plains ended, and a period of intermittent Indian wars that lasted over twenty years began. The military presence in the region grew enormously, the pressure forced the tribes into ever-shrinking spaces, and the Missouri River fur trade that depended on Indian bows and traps for pelts died.[5] Gouverneur Warren took part in all of these developments.

The Army reacted swiftly to the news of the Grattan disaster. Scarcely two months after the fight, the War Department ordered Colonel William S. Harney to report to St. Louis and take command of an expedition against the Sioux. The directive reached Harney in Paris, where his wife and daughter lived, soon after he had crossed the Atlantic. Although he had been promised a two-year leave after a hard tour of duty in Texas, the tough older campaigner packed his bags and, on Christmas eve of 1854, boarded ship for his return to the states.[6]

While Harney organized his force of dragoons, infantry, and mounted artillery, Lieutenant Warren got his marching orders. He was not the first choice to serve as Harney's topographer. Colonel John J. Abert, Chief of Topographical Engineers, initially assigned Captain Thomas J. Lee to the expedition. Lee resigned from the Army, and Abert had to take Warren from his job with the Office of Pacific Railroad Surveys. He received his instructions in late April and reported to Harney in St. Louis a month later.[7]

Even before he arrived in the frontier metropolis, Warren prepared for his assignment. He took along a copy of "Instructions for Astronomical and Magnetic Party," which Lieutenant Amiel W. Whipple had written for another novice topographer, Lieutenant Joseph C. Ives. Whipple's instructions also included reminders on the

William S. Harney. *Library of Congress.*

care of instruments in the field and technical hints on their use. Once in St. Louis, Warren studied the maps of topographical engineers Frémont and Lieutenant Howard Stansbury, who had already traversed parts of the northern plains, and talked with veteran frontiersmen of the American Fur Company. He also met and hired as meteorologist Paul Carrey, an experienced western traveler who had been as far as the White River in northwestern Nebraska and Pueblo in present-day Colorado. From his conversation here and later at Fort Pierre up the Missouri River, he sketched the terrain and jotted down a handful of Sioux words, among them the phrases for "where is the road?", "where is the shortest road?", and "which way?"[8]

Harney moved his 600-man force westward in two columns. Most of the expedition, which included units of the Second and Sixth Infantry, Second Dragoons, and Fourth Artillery, went overland with him. Two companies of the Second Infantry steamed up the Missouri on a paddle-wheeler to establish a supply base at Fort Pierre, which Pierre Chouteau's American Fur Company had just sold to the government after deciding to relocate its upriver operations nearer to the Rocky Mountains. Warren went with the Fort Pierre contingent to reconnoiter the country and lay out a military reservation for the fort. With the river unusually low, the steamer took thirty-nine days to make its way to Pierre.[9]

Fort Pierre, drawn by Captain Alfred Sully of the Second Infantry in 1857. ***South Dakota State Historical Society.***

Dakota can be blazing hot in July, and so it was in the summer of 1855. In no time Fort Pierre joined the ranks of frontier posts hated and cursed by their garrisons. Soldiers of the Second Infantry summed up their feelings in song:

Oh, we don't mind the marching
nor the fighting do we fear,

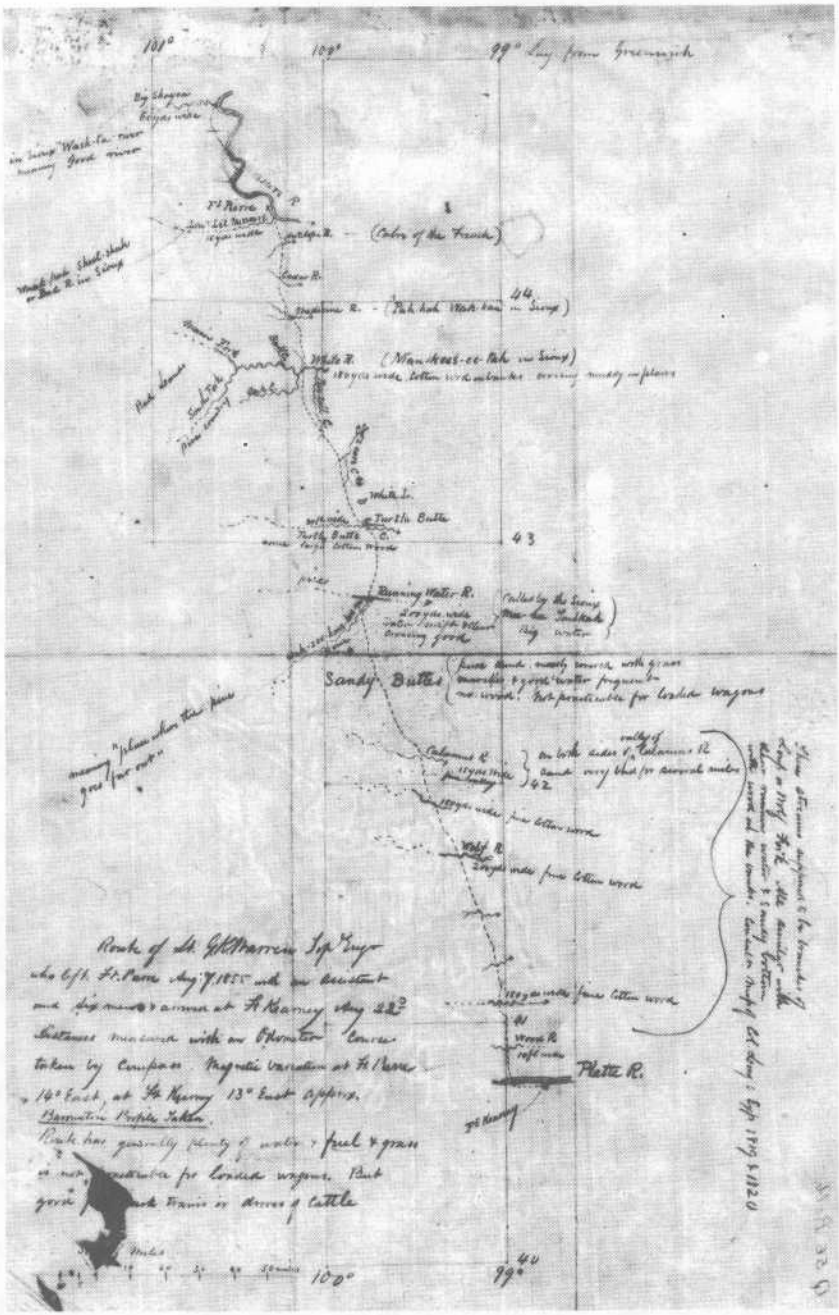
But, we'll never forgive old Harney
for bringing us to Pierre,
They say old Shotto [Chotteau] built it,
but we know it is not so;
For the man who built this bloody ranch
is reigning down below.[10]

The fierce glare of the sun did not deter Warren. While continuing to gather information from the mountainmen, he laid out a 270-square-mile reservation that encompassed a timber reserve, grasslands enough for forage, and arable ground for a post garden. The site in the heart of Sioux country had been a choice one for the fur trade, but the harshness of the country forced Warren to establish a huge reservation. While plotting the boundaries, the heat felled his theodolite bearer, an infantry soldier detailed as Warren's assistant. The soldier recovered; the instrument did not.[11]

Warren had explicit orders regarding his actions after completion of his work at Fort Pierre. He was to go back down the river to Fort Leavenworth on the first available boat and await instructions. However, he did no such thing. Perhaps, as historian William Goetzmann suggests, he had an impetuous streak akin to John Frémont's. Maybe he was just curious about the unknown country to the south of Pierre. In any case, he ignored the advice of the officers at the Fort, recruited six frontiersmen to accompany him and Carrey, and headed south across the Niobrara River and the sandhills to Fort Kearny on the Platte.[12]

Warren's letters and reports show that he understood and even relished the dangers of the 300-mile trek. As he knew, the Sioux to the west and the Pawnees to the east regularly crossed the dune country to raid each other's horses. He thought the Brulés would not hesitate to strike a small military party and was familiar with the Pawnee reputation for marauding. "We shall," he wrote at Fort Pierre, "travel as men of the country, and exercise the greatest vigilence." And so they did. Warren and his party slipped out of Pierre and made their way stealthily southward, crossing several fresh trails and passing recently used Pawnee camps.[13]

Fifteen days later, to the astonishment and delight of Colonel Harney, Warren rode into Fort Kearny. Proudly Warren enumerated the results of his "adventure of great danger": a detailed topographical sketch of the hitherto unexplored trail and a barometric profile of altitudes. In his report he also included a seven-page "Description of route from Fort Pierre to Fort Kearny," a landmark-to-landmark itinerary which identified the locations and quality of wood, water, and grass. Of even greater importance to Harney, who was about to set out in pursuit of the Brulés, was Warren's party itself, the topographer, his assistant, and six first-rate guides and interpreters.[14]



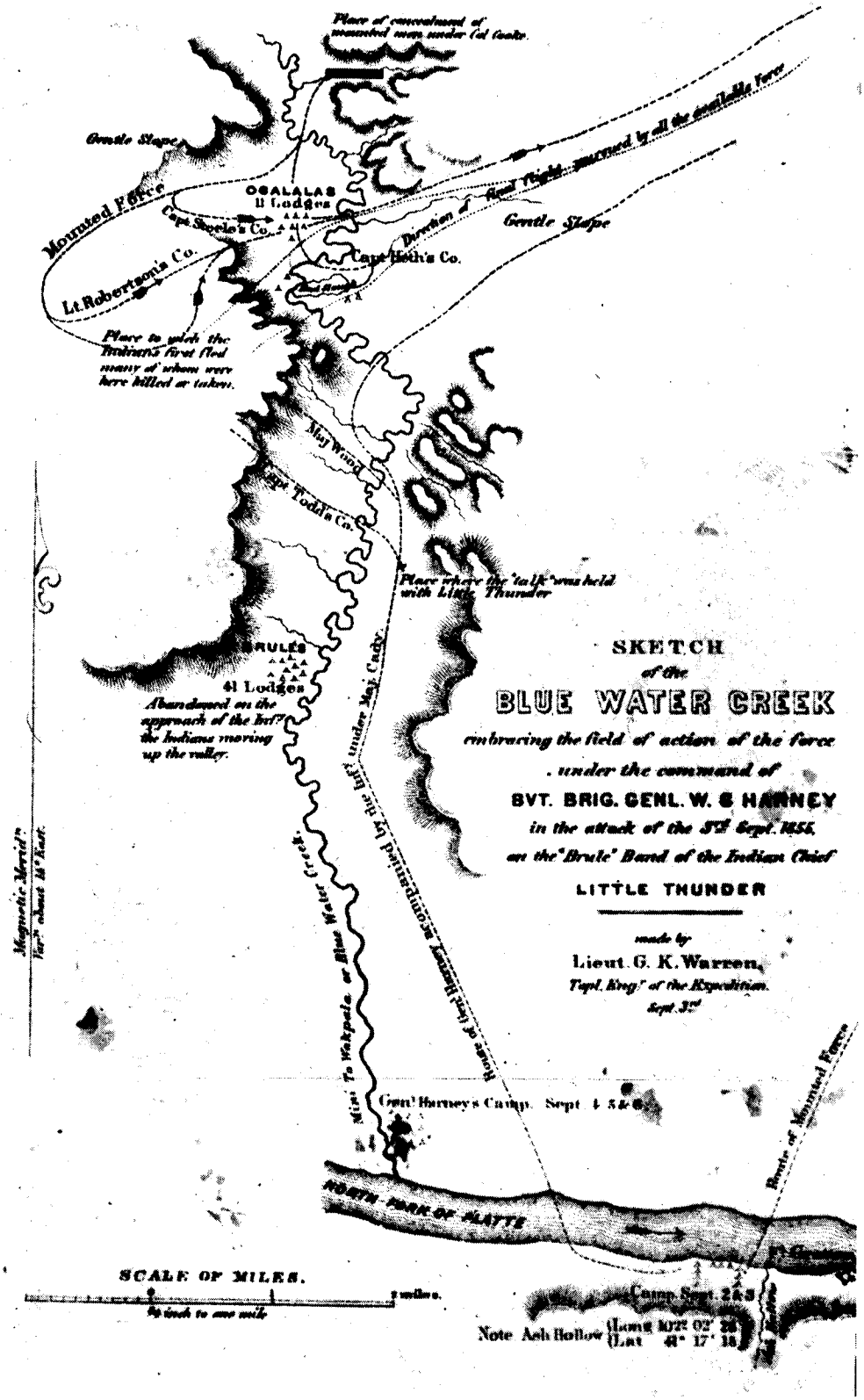
Warren's route from Fort Pierre to Fort Kearny. ***National Archives (Record Group 77, file Q56).***

As Little Thunder's Brulé band soon found out, Harney was a relentless foe. He was also generous and even extravagant in his praise of initiative and daring. In his report to Washington, he applauded Warren's "bold and unauthorized" journey and commended Warren and Carrey for "their zeal and disinterestedness in this hazardous undertaking." He also treated Warren and the other officers of the command to a champagne lunch, and on the next day broke camp and set out against the Brulés.[15]

Harney found Little Thunder's band camped near Ash Hollow on Blue Water Creek, a few miles from where it spills into the Platte. The Indians knew nothing of the enemy that approached in the early morning darkness. Harney set his trap with care, sending Lieutenant Colonel Philip St. George Cooke, two companies of dragoons, an infantry company, and artillery north around the Brulé camp to block the path to the sandhills. Then, still under cover of darkness, he sent his main force directly against the village. Before the soldiers struck, the Indians learned of the danger, took down their teepees, and fled north up the creek—right toward Cooke. Meanwhile, Little Thunder met Harney on neutral ground and tried to negotiate an end to the confrontation. Warren claimed that Harney instigated the meeting "to give time and learn the disposition of these Indians." Harney, who reported only that the meeting took place, offered terms that Little Thunder could not accept—surrender of all the young men who had been involved in the destruction of Grattan's command and other depredations, "all of the butchers of our people," as Harney put it.[16]

There were no surprises in the fight that ensued. The infantry drove the Brulés right into Cooke's cavalry, and the rout was on. Men, women, and children scattered in every direction. Many took to the caves in the cliffs on the west bank of the stream. Some defended themselves there until the soldiers flushed them out. Others fled across the plain, mostly to be cut down by the cavalry. Eighty-six Sioux fell in the encounter; Harney lost four men.[17]

After the fight, Harney again spoke generously about Warren. The commander said his topographer was "most actively engaged," both before and during the shooting, "reconnoitering the country and the enemy." Warren did not mention his actions during the battle, but in his journal recorded at length his activities in the aftermath. He found the battlefield, the first he had ever seen, a dreadful sight. Everywhere, it seemed, lay injured innocents, "wounded women and children, crying and moaning, horribly mangled by the bullets." Most of them had been hit while in the caves from which armed warriors had fired at the soldiers. Warren picked up one young girl and carried her and a small boy to the creek, where he made them a shelter and bathed their wounds. He and other members of the expedition worked until well after sundown tending the injured.[18]



Warren's sketch of the battlefield. ***National Archives (Record Group 77, file Q57a).***

Although preoccupied with this effort, Warren found time to rescue large quantities of Sioux camp equipment from the bonfires to which Harney consigned most captured supplies. In fact, Warren preserved enough material to assemble the largest and most complete collection of pre-Civil War Teton Sioux artifacts. After he completed his work in the west, he donated the collection to the Smithsonian Institution.[19]

Warren seemed to be of two minds about the battle of Ash Hollow. In his published report, he wrote that "the punishment inflicted on the Brulés....at Blue Water has taught them a useful lesson, which they will not soon forget." Furthermore, he recommended taking the fight to other Sioux tribes, so they too would gain respect for the power they faced. In his private journal, he dwelt on other matters. "I was disgusted," he said, "with the tales of valor in the field, for there were but few who killed anything but a flying foe."[20]

One final duty awaited Warren before he and the expedition left Blue Water Creek and marched up the North Platte. Colonel Harney decided to leave a company at Ash Hollow with the wounded and wanted a fort built for their protection. Most of the officers opposed this plan, probably because they thought it unlikely that the Brulés would return for some time. Harney remained adamant, so Warren chose a site and laid out a 100-foot-square stockade. Using Nebraska sod, the soldiers built Fort Grattan with walls three feet thick at the bottom and six feet high.[21]

Warren accompanied the Sioux Expedition on the long march to Fort Laramie, then east along the edge of the Black Hills to Fort Pierre. Along the way he made detailed notes on the unfamiliar terrain between Laramie and Pierre, recording distance, landmarks, and the locations of those travelers' essentials—wood, water, and grass. Because early snows foiled Harney's plan for a winter campaign, the expedition laid over at Pierre. Warren hastened back to Washington where he resumed work on his map in the Office of Pacific Railroad Surveys. His report of the summer's labors, quickly written and just as quickly published, bore praise from Secretary of War Jefferson Davis, who called the document "very useful to the troops on that frontier and to travelers and emigrants."[22]

In April 1856, barely a month after completing his report, Warren boarded Captain John Throckmorton's *Genoa*, a Missouri steamboat bound for Fort Pierre. Meteorologist J. Hudson Snowden, who had traveled with Warren in 1855, made the trip and so did two new companions, topographer N. H. Hutton and geologist Ferdinand V. Hayden. Warren enjoyed riverboat travel and took a liking to Throckmorton, a veteran of the Indian wars of the 1830's. Nevertheless, Warren grew impatient as the *Genoa* struggled against wind and current. Finally, with the vessel aground on a sandbar in the shallows near the mouth of the Niobrara, he, the Fort Pierre sutler, and three others set out overland. They walked 160

miles, subsisting mainly on birds brought down with shotguns. Although the journey was hard, Warren welcomed the chance to examine the terrain away from the river. On 21 May 1856, he reported to Colonel Harney at Fort Pierre. The *Genoa* arrived three days later.[23]

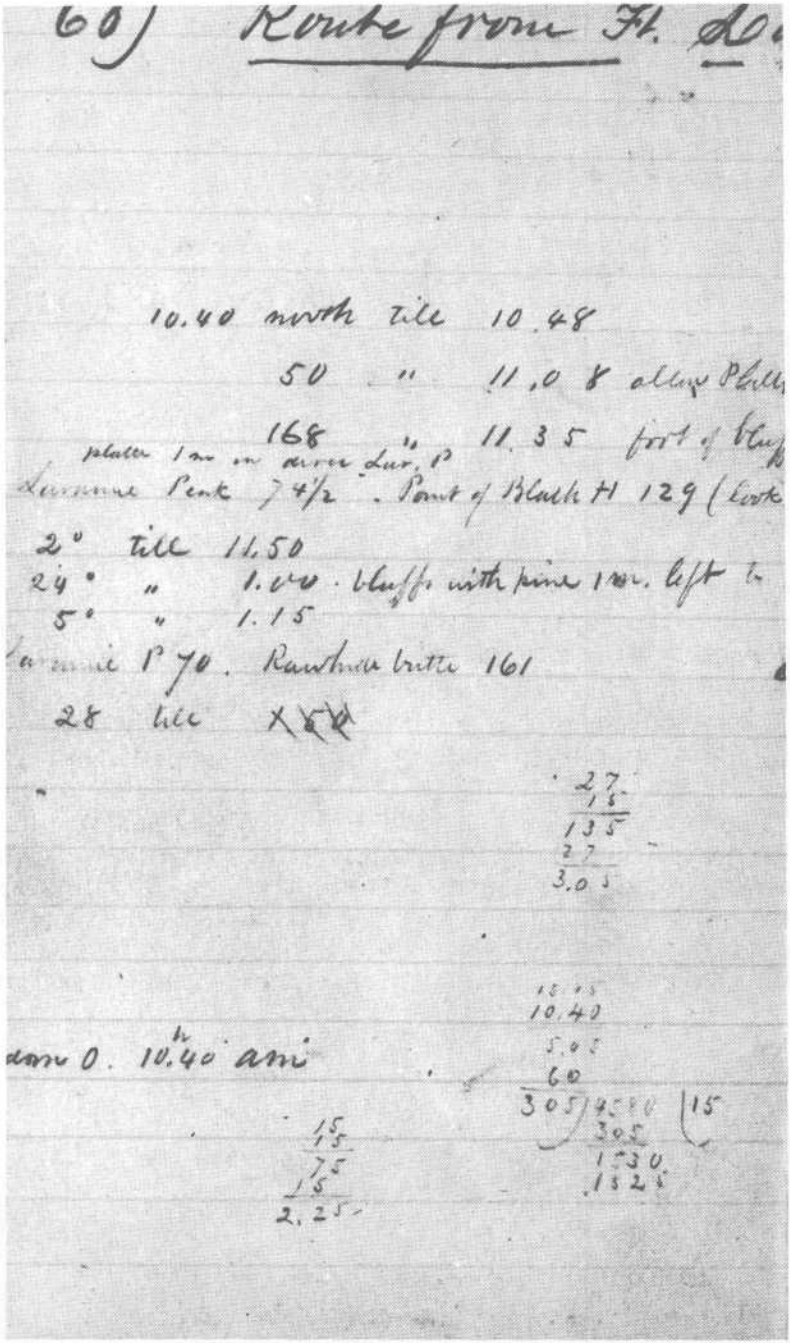
Warren found Harney in council with most of the important Sioux chiefs. Harney introduced Warren to the assembled headmen and told them the lieutenant would spend the summer reconnoitering the upper Missouri. The colonel wanted Warren to cover the country between Pierre and the route of the Pacific railroad expedition that had reached the Missouri near the mouth of the Yellowstone three years previously. The Indian leaders at Pierre, mindful of the blow suffered by Little Thunder, agreed to allow Warren to pass unmolested.[24]

Reunited with those who had stayed on the *Genoa* and reinforced by an infantry detachment, Warren boarded Captain Joseph LaBarge's steamer *St. Mary* for the trip up the Missouri. The captain, who was on a run for the American Fur Company, showed great interest in Warren's work. On the way up river, past the fur trading post at Fort Union into present-day Montana, LaBarge often stopped his vessel so the topographer could examine the countryside. Years later the riverboatman remembered his passenger as

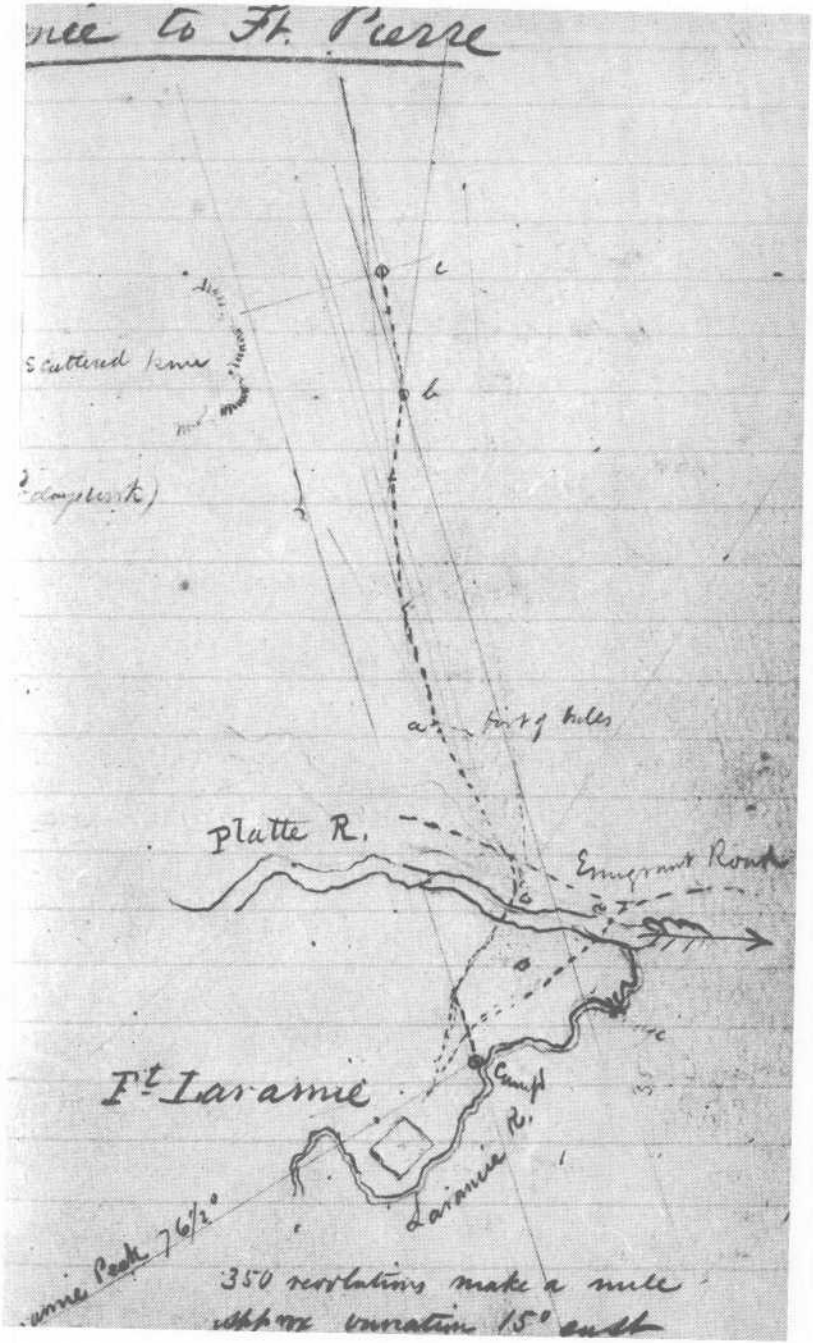
> a very handsome man, with a fine head and clear eye, at that time rather slender, but well built and erect. He was always pleasant, and was liked by his men, but was nevertheless a strict disciplinarian.[25]

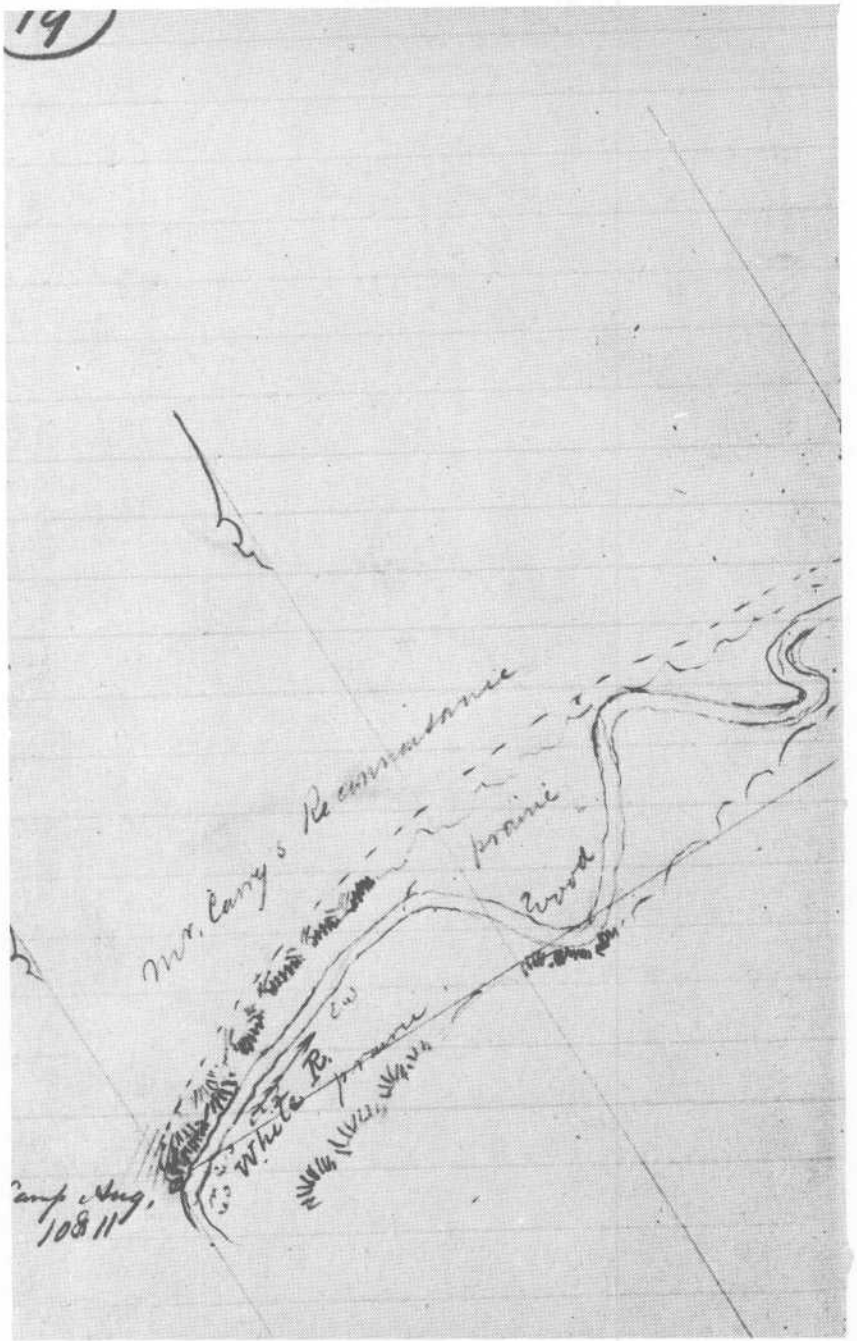
Near Fort Union, Jim Bridger joined the expedition. Bridger knew the Missouri's tributaries as well as any man. He led the way down uncharted portions of the Yellowstone to the mouth of the Powder River. Warren evaluated the terrain for potential fort sites while gathering data for his map. Living off the land was easy. He

Fort Union, as seen by the Pacific Railroad Expedition commanded by Isaac I. Stevens.

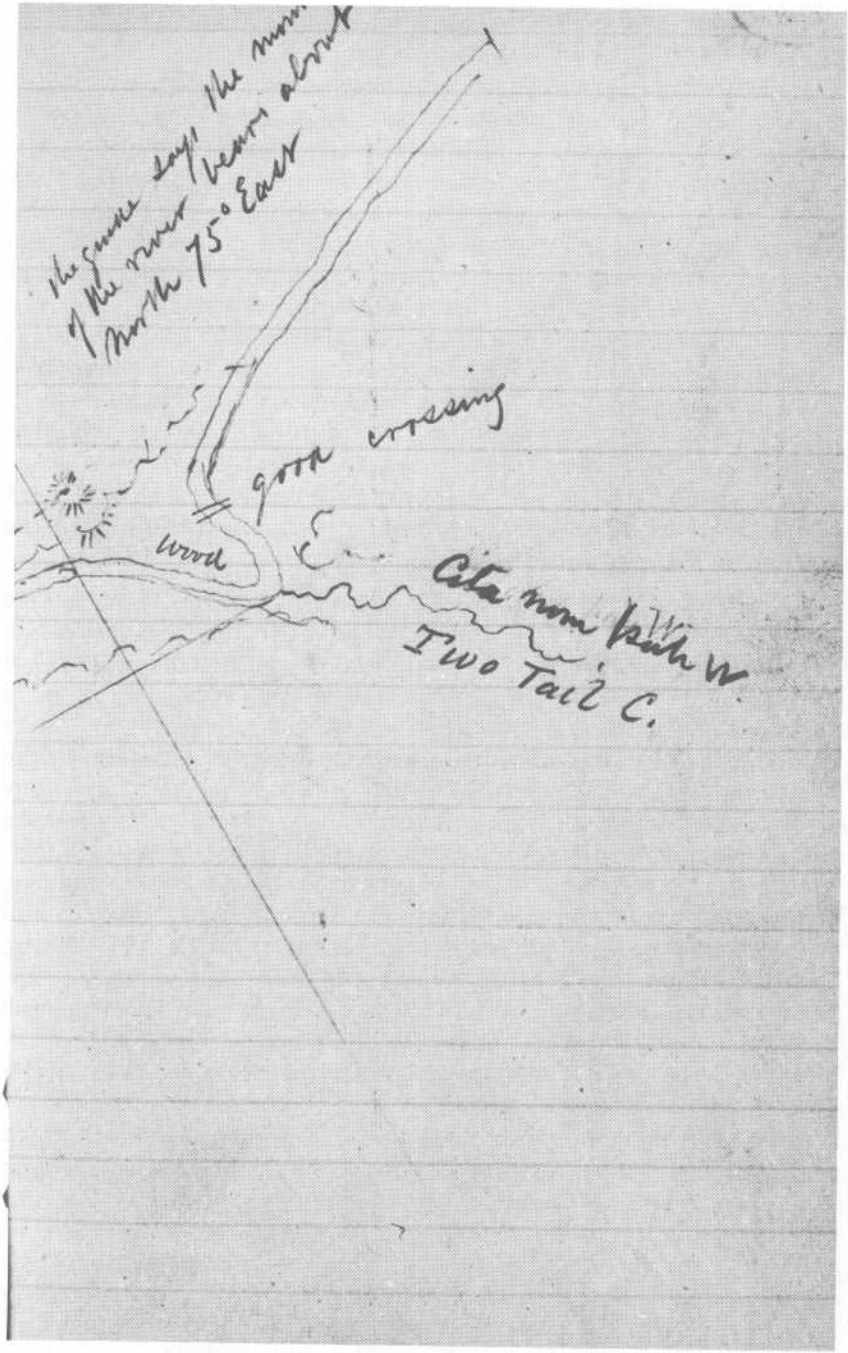


These pages from Warren's 1855 notebook contain topographical notes and a sketch of the Fort Laramie vicinity. ***National Archives (Record Group 77, file Q579-50).***


Scattered trees
Platte R.
Emigrant Road
Ft. Laramie
Camp
Laramie R.
Laramie Peak 76½°
350 revolutions make a mile



Warren's sketch of the upper reaches of White River shows a crossing and the location of wood. ***National Archives (Record Group 77, file Q579-50).***


the course [illegible] the mouth
of the river bears about
North 75° East
good crossing
wood
Two Tail C.

and his men "enjoyed the greatest abundance of large game of all kinds while on the Yellowstone...."[26]

On the first of September, Warren began the month-long trip back to Fort Pierre. Most of the party paddled to Fort Union in a flat-bottomed bullboat made of buffalo skins stretched over a cottonwood frame, then switched to a wooden craft for the rest of the way down the Missouri. A shore contingent of seven herded the animals. Warren stopped at the mouths of tributaries to note their positions and examine the country. His progress was uneventful until the boat struck a sandbar near Fort Pierre and spun broadside against the current. The men leaped into the 40° water and freed the craft before it became uncontrollable. With an eye on the Indians watching from shore, Hutton noted that the party "presented an appearance much more interesting to our enemies than agreeable to our friends." Warren reached Pierre safely, released his escort, and continued downriver to Sioux City. From there travel became easier and more comfortable, as he took a steamboat to St. Louis and finished the journey to Washington by rail.[27]

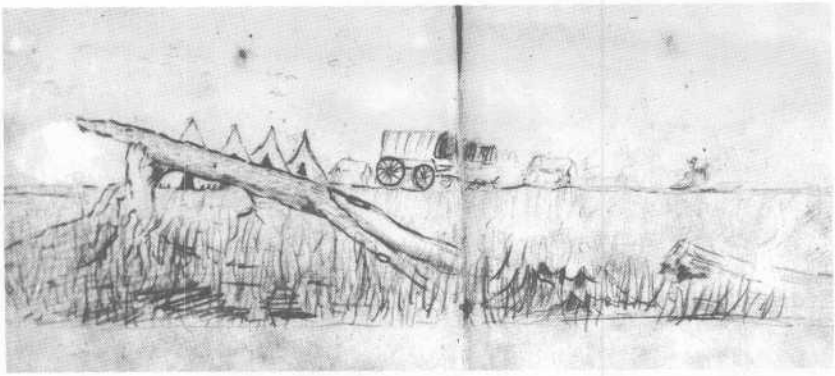
In 1857, with his map of the trans-Mississippi West nearly completed, Warren returned to Nebraska. This time his travels took him up the Loup to the sandhills and then along the Niobrara to Fort Laramie and back through the Black Hills. This probe proved to be the most difficult and dangerous of his three northern plains expeditions. His troubles included Loup River quicksand, the ubiquitous Platte valley mosquitoes, the Sioux, and even his military escort. Before he set out for the mouth of the Loup, most of his 27-man escort became drunk and insubordinate. Twelve of the soldiers, "tempted," Warren said, "by the high price of labor in this vicinity, and tired of the toils and privations of campaigning," deserted, and thieves stole two of the party's horses. Still near Sioux City, Warren wondered what might befall him in less hospitable surroundings: "These losses occurring in a civilized community, where we supposed ourselves among friends, were quite annoying, and gave rather unpleasant forebodings of what might occur to us when we should come among our enemies, the Indians."[28]

Quicksand, rain, and plain hard work marked the journey into the sandhills. The bed of the North Loup was so treacherous that a wagon sank clear to its floorboards as the party tried to cross the river. The men waded into the muck and hauled the baggage ashore, then extricated the vehicle. Later, they bridged several streams on their way northwest. One seriously ill soldier rode in a wagon, which was fine until a jackrabbit stampeded the herd and sent the makeshift ambulance careening down a steep hill. Fortunately the conveyance remained upright, and the party finished the journey to the head of the Loup safely. The reconnaissance filled a small white space on Warren's map, but he wondered if the effort was worthwhile:

A soldier of the 1857 party. ***National Archives (Record Group 77, file Q579-53).***

> We have now traced the river from end to end and found its impracticability for almost any purpose so marked that it seems like a great waste of time to have made the exertions we have. Our greatest wish is to get away from it as soon as possible and never return.[29]

The trip up the Loup had been hard but at least there had been water. During their first two days in the dune country, the party found none at all. On August 9, Warren sighted a lake in the distance, and the men rushed forward, only to find it "so salty and bitter that a mule would not drink it." They managed to get some palatable water by digging a hole in the sand. Two days later a driving rain brought relief. They collected the water in barrels for the remainder of the trek to the Niobrara, or Running Water as the Sioux called the fast moving stream. The river was only a short distance away but was difficult to reach because the sandhills forced them onto a southwesterly course away from it. They took more than a week to cross the 40-mile expanse of sand between the head of the Loup and Running Water.[30]



A camp of the 1857 expedition. ***National Archives (Record Group 77, file Q579-53).***

The bone-weary travelers found the remainder of the journey to Fort Laramie much easier. The striking windcut formations of the upper reaches of the Niobrara, which reminded Snowden of ruins of ancient forts and castles, did not impede their progress. On August 18, they looked down on the valley of the North Platte, and "the prospect of reaching Laramie cheered everyone." On the next day, Warren's exhausted party arrived at the post for a well-earned rest.[31]

Warren rested at Fort Laramie for two weeks, planning a reconnaissance into the Black Hills. Although the hills were the center of the shrinking Sioux hunting grounds, Warren thought the Indians would let him pass in peace. When he had met a Sioux band on the way up the Niobrara, they had fled in terror. Moreover, Major Thomas Twiss, the former Engineer officer who served as Indian agent at Fort Laramie, also believed the Sioux would not trouble Warren. They had complained to Twiss, but appeared satisfied with assurance that Warren would not make a road through the region.[32]

The great deal of military activity on the North Platte also increased Warren's confidence. Troops bound for Utah, where war with the Mormons was imminent, passed Fort Laramie, as did a column operating against the Cheyennes. In addition to these and Warren's own party, a fellow topographical engineer, Lieutenant Francis T. Bryan, explored a potential railroad route south of Fort Laramie, up Lodgepole Creek to Bridger Pass. The day before setting out, Warren wrote his father that the display of force "completely overawed" and puzzled the Indians. So, supposing that all this activity impressed and puzzled the Sioux, Warren left for the Black Hills, expecting a hard but fruitful journey.[33]

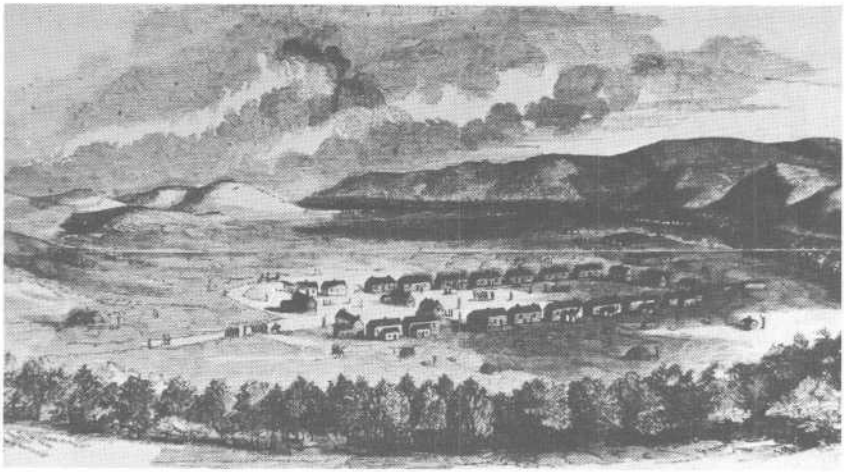
Snowden and a portion of the expedition remained at Laramie preparing to examine the Niobrara before meeting Warren downstream, east of the hills in mid-October. Those who stayed got more than enough trader whiskey, a rank mixture which some say

was spiked with chewing tobacco, red peppers, and even rattlesnake heads, and discipline began to weaken. Ten days, one desertion, and two horsethefts after Warren left, Snowden led his party toward the source of the White River, east of the modern Nebraska-Wyoming line near the yet undiscovered deposits of dinosaur bones at Agate Springs. Once cheered by the sight of Laramie, Snowden was happy to put the post behind him.[34]

Contrary to Warren's expectations, the Sioux blocked his path through the Black Hills. Shortly after he entered near Inyan Kara peak, a large force of warriors led by a Hunepapa Sioux chief named Bear's Rib demanded that Warren turn back. Bear's Rib was very persuasive. He feared that Warren would spook the buffalo, but dreaded even more the potential military value of the reconnaissance. The angry warriors with him were more convincing. Bear's Rib allowed Warren to leave by a northern route, and the lieutenant wisely departed. He cut across what is now the Pine Ridge Indian Reservation, camped on Wounded Knee Creek, and followed the Keya Paha to its junction with the Niobrara. He found Snowden on October 15, making his way downstream along the northern fringes of the sandhills.[35]

Snowden, who endured "a very tortuous and fatiguing march, as bad if not worse than any of our sandhills experience," also confronted an angry Sioux party. On October 11, Brulé warriors stopped him and complained that Harney had assured them no whites would pass through their lands without a license from him (they did not know—and probably would not have cared if they did—that Congress had repudiated Harney's agreements). The Indians protested Snowden's profligate consumption of the resources along the Niobrara, the plums and chokecherries, wood and grass. Moreover, they accused the whites of frightening the game for a hundred miles in every direction. Snowden had to threaten to open fire before the Sioux withdrew from his camp.[36]

Reunited on October 15, Warren and Snowden traveled to Fort Randall while a small detachment followed the Niobrara to its confluence with the Missouri. The trip from Laramie had been hazardous, but Warren had obtained important information about the river. His reconnaissance convinced him of the impossibility of road construction in the Niobrara valley. The upper two-thirds of the stream ran swift and shallow through deep canyons. The lower portion, wider than the Missouri, was almost uncrossable due to the treacherous bottom. Warren discouraged consideration of a proposed road from Lake Superior southwestward across Minnesota, Dakota, and Nebraska to the Platte where it would join the main road through South Pass to Oregon. Such a trail would have to cross Running Water three times. Besides, the Sioux would oppose such an effort. Anyone bold enough to attempt a road survey through their hunting grounds would need the protection of at least 200 tried men. Warren



Fort Randall. *Nebraska State Historical Society.*

was convinced "the Sioux are in earnest about stopping white men from coming there anymore."[37]

Carefully Lieutenant Warren pondered the difficulties and options confronting the Sioux. He had at one time urged that the Indians be taught respect for the whites. After three seasons among the Sioux, he had developed considerable regard for them. Although he erred in calling the seven autonomous Teton Sioux tribes a nation, he made no mistake about their military skill and determination. They were superb horsemen "numerous, independent, warlike, and powerful . . ." and had the strength and will for "prolonged and able resistance to further encroachment of the western settlers."[38]

While he knew that any effort to dislodge the Sioux would bring war, he also recognized that the attempt would nonetheless be made. Personally familiar with the growth of white settlement on the Missouri River, Warren concluded that the resultant pressure on the Sioux hunting ground, combined with the process of Indian dispossession to the east of the Sioux domain, hastened war. Indians evicted from their land and forced west ultimately exerted pressure on the resources available to plains natives. This, in turn, caused poverty and disease, while the government exacerbated these ills by its failure to protect and support the dispossessed. Concluding this sophisticated analysis, Warren said there were "so many inevitable causes at work to produce a war with the Dakotas before many years, that I regard the greatest fruit of the explorations I have conducted to be the knowledge of the proper routes by which to invade their country and conquer them." He was not particularly proud of this accomplishment: "I almost feel guilty of crime in being a pioneer to the white men who will ere long drive the red man from his last niche of hunting ground."[39]

Warren also laid bare the dilemma that faced Sioux leaders who understood the process then underway. Bear's Rib, for example, a man with "fine mental powers and a proper appreciation of the relative power of his people and the whites . . .," trod a very narrow and dangerous path, knowing that surrender would make him an outcast but that advocacy of resistance would make him responsible for the destruction of the tribe. Ultimately the Huncpapa chief's personal dilemma was resolved by Sioux enemies, who assassinated him in July 1862. But the problem of providing appropriate guidance in this crucial period tormented many a Sioux leader.[40]

At the end of 1858, with the map of the trans-Mississippi West just published and three western explorations under his belt, Warren could have rested on his well-earned laurels. As he told his father, "I have every reason to believe I have gained for myself a good reputation as a Topographical Engineer." Certainly he had seen sufficient service to accept a teaching appointment to West Point without compunction. But the frontier had found its way into Warren's blood. His discussions with Jim Bridger and other mountainmen whetted his appetite for the Yellowstone country, the fabulous wonderland of bubbling mud and hot water spouts first visited by John Colter after he left the Lewis and Clark expedition for the life of a trapper in the northern Rockies. Warren presented Captain Andrew A. Humphreys with a detailed proposal for the exploration, which Warren hoped might reveal connections between Utah and navigable portions of the upper Missouri. Humphreys recommended approval of the project. With his experience and ability, Warren was the right man to fill this blank space on the map.[41]

Yet when the Yellowstone expedition set out in the spring of 1859, Warren was not at its head. Earlier in the year, his father died. Then Warren accepted a position as assistant professor of mathematics at West Point to be near his younger brothers and sisters at the family home in Cold Springs, New York.[42]

The Civil War interrupted Warren's tour of duty at the academy. He entered active service as a volunteer lieutenant colonel, second in command of a New York regiment, and rose to the rank of major general. Warren's most important service came during the seond day of the battle of Gettysburg. While chief engineer of General George C. Meade's Army of the Potomac, Warren rushed reinforcements to Little Round Top just in time to fend off a Confederate assault on the Union Army's left flank. His quick action and keen eye for terrain helped prevent a possible disaster for Union arms.[43]

Just before the end of the war, at the battle of Five Forks in Virginia, General Philip Sheridan removed Warren from command of the Fifth Corps. Sheridan's motive remains unclear, but the effect on Warren's career was decisive. Many of his peers kept or went beyond their Civil War ranks, but Warren reverted to his permanent

rank of major and received only one promotion to lieutenant colonel in the next 17 years. During this time he served as district engineer in St. Paul, Minnesota, and Newport, Rhode Island. In 1879, the government finally consented to examine the matter and convened a court of inquiry. Warren died on 8 August 1882. Three months later, the court absolved him of wrongdoing.[44]

Warren's career included the normal blend of civil and military engineering assignments. He participated in river improvements, exploration, cartography, and both conventional and Indian warfare. Moreover, one kind of duty plainly enhanced the ability to perform another. Three expeditions into the northern plains sharpened the fine eye that saved the day at Gettysburg.

Like so many other documents of Engineer exploration, Warren's account of his travels involved the collaboration of a number of scientists. By the mid-1850's, it was common practice for scholars to accompany expeditions beyond the settlements. They used the opportunity to study and assess plants and animals, geological formations, and native peoples. Frequently, the Smithsonian Institution played an important part in this enterprise, informing scientists of expeditions and their destinations, lending equipment to explorers, finding experts at universities to study collections, and occasionally providing letters of introduction to foreign specialists. On the other hand, Warren and many other explorers deposited their natural history collections with the museum.[45]

While Ferdinand Hayden was the only scientific collector to accompany Warren, several others participated in the analysis of his specimens. Hayden's "Catalogue of the Collections in Geology and Natural History," appended to Warren's report, bore the names of many prominent scholars of the day. Among them were John Torrey, Fielding B. Meek, John S. Newberry, George Engelman, and Spencer F. Baird of the Smithsonian, all of whom cooperated with many expeditions.[46] Hayden's inventories, completed with the cooperation of these and other scholars, provided a record of the fauna and flora of the region and indicate the changes that have since taken place.

The publication history of the report underscores the importance of relations with the Indians. Originally printed without a map, the document appeared as an appendix to the Secretary of War's bulky annual report of 1858. In 1875 the War Department reissued the narrative, this time as a separate volume with a map. The year of publication was significant. The existence of paying quantities of gold in the Black Hills had been verified during the previous summer. A year after publication, the major battles of the Sioux wars would be fought. The slim book carried a dual message to those eager to seek their fortunes in the Sioux homeland. While it contained the map and data that travelers to the region so badly needed, it also delineated the risks they faced. Captain Humphreys' introduction to

Ferdinand Hayden, by J. Hudson Snowden. ***National Archives (Record Group 77, file Q579-53).***

the 1858 edition, pertinent when it was written, was even more meaningful in 1875: Warren's narrative, Humphreys cautioned, gave "the objections urged by the Sioux against the passage ... through the territory. This may prove valuable to any white man that may travel there."[47]

The report provides more than a record of Warren's travels and campaigns.[48] In addition to discussing the terrain, identifying fort sites, and evaluating potential roads, Warren dealt at length with the problems Indians and Anglo-Americans presented each other. A perceptive and articulate participant in the expansion of the military presence in the Missouri River valley, Warren understood the forces that brought on the climactic Indian wars. At a critical time in the region's history, as war with the Sioux became imminent, he described the Indians, their fighting qualities, and attachment to their homeland, as well as the physical features of the country in which the Army would have to fight them. Hayden's inventories,

while not as engaging as Warren's narrative, rounded out the picture. Warren's *Preliminary Report* depicted a region in transition and documented an important phase of the Army Engineer role in the settlement of the West.

NOTES

1. Warren to Sylvanus Warren, 6 October 1851, Warren Papers, New York State Library, Albany.
2. General Orders No. 5, Headquarters, Corps of Engineers, United States Army, 9 August 1882, File 649 ACP 76, Gouverneur K. Warren, Record Group 94, National Archives.
3. For a survey of the role of topographical engineers in the westward movement, see Frank N. Schubert, *Vanguard of Expansion: Army Engineers in the trans-Mississippi West, 1819–1879* (Washington: Government Printing Office, 1980). William H. Goetzmann, *Army Exploration in the American West, 1803–1863* (New Haven: Yale University Press, 1959), is a more detailed account.
4. Robert M. Utley, *Frontiersmen in Blue: The United States Army and the Indian, 1848–1865* (New York: Macmillan Publishing Co., Inc., 1967), pp. 113–14.
5. Robert G. Athearn, *Forts of the Upper Missouri* (Englewood Cliffs, New Jersey: Prentice-Hall, 1967), pp. 33–34.
6. Logan V. Reavis, *The Life and Military Services of Gen. William Selby Harney* (Saint Louis: Bryan, Brant & Co., 1878), pp. 247–48.
7. Warren to Colonel John J. Abert, 21 April and 31 May 1855, Letters Received, Topographical Bureau (Microcopy 506, Roll 80), Record Group 77, National Archives.
8. Warren, Journal 1855, Warren Papers; Warren, "Notes taken on the Sioux Expedition by Lieut. G. K. Warren, Top'l Engr," Headquarters Map File (Q 578), Record Group 77, National Archives.
9. Frederick T. Wilson, "Fort Pierre and its Neighbors," *Journal of the United States Cavalry Association*, XII (September 1899) pp. 241–42; Assistant Adjutant General, Sioux Expedition (Captain Oscar F. Winship), to Warren, 4 June 1855, and Warren to Colonel Abert, 19 September 1855, Letters Received, Topographical Bureau (Microcopy 506, Roll 80).
10. Wilson, "Fort Pierre," p. 228.
11. Assistant Adjutant General, Sioux Expedition, to Warren, 4 June 1855, Warren to Colonel Abert, 21 March 1856, Letters Received, Topographical Bureau (Microcopy 506, Roll 81); Hiram M. Chittenden, *The American Fur Trade in the West*, vol. II (Stanford: Academic Reprints, 1954), p. 767.
12. Assistant Adjutant General, Sioux Expedition, to Warren, 4 June 1855, Letters Received, Topographical Bureau; William H. Goetzmann, *Exploration and Empire: The Explorer and the Scientist in the Winning of the American West* (New York: Alfred A. Knopf, 1967), p. 309; Gouverneur K. Warren, *Ex-*

plorations in the Dakota Country in the Year 1855, 34th Congress, 1st Session, Senate Executive Document 76 (1856), p. 21.

13. Warren, *Explorations ... 1855*, pp. 21-35.
14. Warren, *Explorations ... 1855*, pp. 22-27; Warren to Colonel Abert, 23 August and 19 September 1855, and 28 January 1856, Letters Received, Topographical Bureau (Microcopy 506, Rolls 80 and 81).
15. Warren to Colonel Abert, 28 January 1856, Letters Received, Topographical Bureau; Warren, Journal 1855.
16. Warren, Journal 1855. Harney's report of 5 September 1855 is reprinted in Reavis, *Harney*, pp. 252-58.
17. Reavis, *Harney*, p. 256; Merrill J. Mattes, *The Great Platte River Road* (Lincoln: Nebraska State Historical Society, 1969), pp. 320-24.
18. Reavis, *Harney*, p. 258; Warren, Journal 1855.
19. Dr. James Hanson of the museum is presently preparing an enthnohistorical analysis of the Warren collection.
20. Warren, *Explorations... 1855*, p. 19; Warren, Journal 1855.
21. Warren, Journal 1855.
22. Reavis, *Harney*, p. 260; Secretary of War Jefferson Davis to Honorable John B. Weller, Chairman, Committee on Military Affairs, US Senate, 26 March 1856, in Warren, *Explorations... 1855*, pp. 1-2.
23. Warren, Journal, 1856, Warren Papers; Warren to William J. Warren, 24 May 1856, Warren Papers; N. H. Hutton, Journal for June 28—October 27, 1856, Warren Papers.
24. Gouverneur K. Warren, *Preliminary Report of Explorations in Nebraska and Dakota, in the Years 1855-56-57* (Washington: Government Printing Office, 1875), pp. 13, 15; Warren to William J. Warren, 24 May 1856, Warren Papers; Utley, *Frontiersmen in Blue*, p. 118.
25. Hiram M. Chittenden, *History of Early Steamboat Navigation of the Missouri River: Life and Adventures of Joseph LaBarge, Pioneer Navigator for Fifty years identified with the Commerce of the Missouri Valley*, vol. I (New York: Francis P. Harper, 1903), pp. 208-09.
26. Gouverneur K. Warren, *Memoir to Accompany the Map of the Territory of the United States from the Mississippi River to the Pacific Ocean*, 33d Congress, 2d session, House of Representatives Executive Document 91 (1855), vol. XI, p. 90; Warren, Journal 1856; Warren, *Preliminary Report of Explorations*, pp. 15-16; Vincent J. Flanagan, "Gouverneur Kemble Warren, Explorer of Nebraska Territory," *Nebraska History*, 51 (Summer 1970), p. 183. The section of the text on the return during 1856 and the expedition of 1857 is adapted with minor changes from Schubert, *Vanguard of Expansion*, pp. 122-29.

27. Hutton, Journal for 1856; Warren, *Memoir*, p. 90; Warren, *Preliminary Report of Explorations*, p. 16.
28. Gouverneur K. Warren, Lieut. Warren's Official Journal Commanding Explorations in Nebraska, 1857, Warren Papers.
29. Warren, *Preliminary Report of Explorations*, p. 17; J. Hudson Snowden, Journal 27 June—14 November 1857, Warren Papers; Warren, Official Journal of 1857.
30. Warren, Official Journal of 1857.
31. Snowden, Journal, 1857.
32. Warren, Official Journal of 1857; Warren to Sylvanus Warren, 3 September 1857, Warren Papers.
33. Warren to Sylvanus Warren, 3 September 1857.
34. Warren, *Preliminary Report of Explorations*, p. 18; Snowden, Journal, 1857; Mari Sandoz, *Love Song to the Plains* (Lincoln: University of Nebraska Press, 1966), pp. 79–80.
35. Warren, *Preliminary Report of Explorations*, pp. 18–21; Warren, Official Journal of 1857; Snowden, Journal, 1857.
36. Snowden, Journal, 1857; Utley *Frontiersmen in Blue*, p. 119.
37. Warren, letter draft, 27 January 1858, Warren Papers.
38. Warren, *Preliminary Report of Explorations*, pp. 51–52, 79. The seven tribes were Oglala, Brulé, Miniconjou, Sans Arc, Two Kettle, Blackfoot, and Huncpapa.
39. Warren, *Preliminary Report of Explorations*, p. 53; Warren, letter draft, 27 January 1858.
40. Warren, updated letter draft, Warren Papers; Utley, *Frontiersmen in Blue*, p. 271.
41. Warren to Sylvanus Warren, 9 December 1858, Warren Papers; Warren, *Preliminary Report of Explorations*, pp. 7, 10–11.
42. Captain William F. Raynolds commanded the expedition. See his *Report on the Exploration of the Yellowstone River* (Washington: Government Printing Office, 1868).
43. Bruce Catton, *The Army of the Potomac: Glory Road* (Garden City: Doubleday, 1952), pp. 291–94.
44. Louis H. Manarin, "Major General Gouverneur Kemble Warren: A Reappraisal," unpublished M. A. thesis, Duke University, 1957, argues convincingly that Warren's outspoken criticism of his superiors set the stage for his dismissal from command.
45. Schubert, *Vanguard of Expansion*, pp. 63, 104. Manuscript collections of the Smithsonian Institution's archives, particulary the private correspondence of Spencer Baird, detail the extent and character of the museum's relationship with officers of the Corps of Engineers and Corps of Topographical Engineers.
46. Schubert, *Vanguard of Expansion*, pp. 63–64, 89–90, 139.
47. Quoted in Warren, *Preliminary Report of Explorations*, p. 6.

48. Other firsthand accounts of the battle at Ash Hollow were written. These included the following: Philip St. George Cooke, "March of the 2d Dragoons ...," ed. by Hamilton Gardner, *Annals of Wyoming*, 27 (April 1955), pp. 43–60; Richard C. Drum, "Reminiscences of the Indian fight at Ash Hollow, 1855," *Collections of the Nebraska State Historical Society*, 16 (1911), pp. 143–64; John B. S. Todd, "The Harney Expedition against the Sioux: The Journal of Capt. John B. S. Todd," ed. by Ray H. Mattison, *Nebraska History*, 43 (1962), pp. 110–11.

ENGINEER DEPARTMENT, UNITED STATES ARMY.

PRELIMINARY REPORT

OF

EXPLORATIONS

IN

NEBRASKA AND DAKOTA,

IN THE

YEARS 1855-'56-'57,

BY

LIEUT. G. K. WARREN, TOPOGRAPHICAL ENGINEERS, U. S. ARMY,

[NOW MAJOR OF ENGINEERS, AND BVT. MAJOR GENERAL, U. S. A.]

REPRINT.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1875.

NOTE.—This report was originally printed in the appendixes to the Report of the Secretary of War, in the President's Message and Documents, December, 1858.

The map was printed by resolution of the United States Senate.

OFFICE OF THE CHIEF OF ENGINEERS,
Washington, D. C., August 18, 1875.

SIR: In 1857 an exploration of the Black Hills was made by Lieut. G. K. Warren, Topographical Engineers, (now major of engineers, and brevet major-general United States Army.)

A preliminary report of this exploration (embracing also his explorations in Nebraska and Dakota for the two previous years, 1855–'56) was appended to my annual report, as captain of Topographical Engineers in charge of office of explorations and surveys for the War Department, for the year 1858.

As this report was printed with the documents accompanying the President's annual message to Congress in December 1858, (in the annual report of the Secretary of War,) it can always be referred to for official purposes, but is not accessible to those specially interested in the region of which it treats.

Recent developments in the Black Hills country have awakened a great interest in that region, and there are constant inquiries for the report referred to.

I would therefore recommend that this report be reprinted at the Government Printing-Office, and that 2,000 copies be furnished to this Office, upon the usual requisition.

Very respectfully, your obedient servant,

A. A. HUMPHREYS,
Brigadier-General and Chief of Engineers.

Hon. WM. W. BELKNAP,
Secretary of War.

Approved by order of the Secretary of War.

H. T. CROSBY,
Chief Clerk.

AUGUST 20, 1875.

[EXTRACT FROM THE ANNUAL REPORT OF CAPTAIN A. A. HUMPHREYS TOPOGRAPHICAL ENGINEERS, IN CHARGE OF EXPLORATIONS AND SURVEYS, TO THE SECRETARY OF WAR.]

WAR DEPARTMENT, OFFICE EXPLORATIONS AND SURVEYS,
Washington, November 20, 1858.

* * * * * * *

EXPLORATIONS IN NEBRASKA.

The return in November last of the expedition commanded by Lieut. G. K. Warren, Topographical Engineers, after the successful execution of the duties intrusted to him of reconnaissance and exploration in Nebraska, has been already reported. The maps have been completed, all the necessary calculations of the astronomical and barometrical observations made, and the reports in relation to the different objects of the expedition are in an advanced state.

The principal objects of the expedition were to ascertain the best route by which to continue to the South Pass the military road now constructing from the Mississippi River to Sioux City, on the Missouri, and to examine in this connection the valley of the Loup Fork of the Platte, and that of the Niobrara, and to make such reconnaissance of the Black Hills, about the sources of the Big Cheyenne, as circumstances would permit, to determine their character, especially with reference to the future military operations that may be carried on in this Territory. In accomplishing these objects, the expedition would obtain information of the character and resources of the country, its adaptability to settlement and cultivation, and would develop its geography and geology along the routes pursued, nearly all of which were previously unexplored by white men.

The preliminary report of Lieutenant Warren is herewith presented. The routes reconnoitered and mapped in 1857 are from Sioux City to the mouth of Loup Fork; thence up this stream to its source in the Sand Hills; and thence by the Niobrara to Fort Laramie. From this point the party proceeded north, and carefully examined the Black Hills, and, returning to the Niobrara, explored this stream to its junction with the Missouri; and also a route from the mouth of Turtle Hill River to Fort Randall. Finally, the road from Fort Randall to Sioux City was surveyed.

With the report on these routes Lieutenant Warren combines that of the routes examined by him in 1856, under orders from General Harney, of which examinations no report has heretofore been presented.

In that year he made a careful reconnaissance of the Missouri River, from the southern boundary of Nebraska to a point sixty miles above the mouth of the Yellowstone, and of this latter stream to Powder River.

The routes explored, including those of 1858, (of which a report has been rendered and printed,) all lie east of the 106th meridian. They lead once through the Sand Hills north and south, and twice east and west, almost around the Black Hills, and through the valleys of the following rivers, viz: the Platte, Loup Fork, Niobrara, White Earth, Big Cheyenne, Missouri, Yellowstone, and James rivers.

The accompanying report of Lieutenant Warren is divided as follows:

Part 1 is a statement of the routes pursued and main incidents which affected their direction and extent; and in connection with this are given the objections urged by the Dakotas against the passage of the expedition through the Territory. This may prove valuable to any white men that may travel there.

Part 2 contains a general description of the surface of Nebraska; an account of the general structure of the country; its principal geological formations and the character of the soil; and its adaptability in different parts to settlement.

It confirms the statements heretofore made by explorers in other portions of the western prairies of the generally sterile character of the lands west of the 99th meridian, attributable to the absence of fertile elements in the soil in large tracts like the Sand Hill region, and to the want of timely rains.

The section in the mountains bordering these plains on the west is described as containing small fertile valleys, with streams of water and an abundance of building material, both of stone and wood, and an ample supply of the latter for fuel. The opinion is expressed that this section will be overspread by considerable settlements.

Part 3 contains a general description of the rivers and routes through the Territory, with a discussion of the question as to the best route by which to supply Fort Laramie and the interior. The conclusions arrived at in regard to this last question are, that the route up the Loup Fork is impracticable, and, besides, is less direct than the Platte route; that the route along the Niobrara is barely practicable for wagons, and that the difficulties to be met with on the road, together with the increased river transportation of the route, render it less favorable than that up the Platte, whether the starting-point be Omaha City or Nebraska City; that a road from Sioux City to Fort Laramie, along the Niobrara, would only be about forty miles shorter than a road proceeding from the same point direct to the Platte, at the mouth of Loup Fork, and thence along the Platte route to Fort Laramie; that the shorter length of the Niobrara route is more than counterbalanced by the great difficulties on that route, and therefore the route along the Platte is the better of the two; that the route from the mouth of White River west to Fort Laramie is probably practicable, and superior to that along the Niobrara; that the route from Fort Pierre to Fort Laramie is likewise superior to the Niobrara route, but that the increased river transportation and absence of settlements along this part of the Missouri River render these routes at present inferior to those of the Platte Valley; that above Fort Pierre, on the navigable part of the Missouri River, there are no routes leading from it to Fort Laramie or the South Pass that are as advantageous as those enumerated. It is further concluded that, of all the routes explored, the Platte Valley is the best adapted for locating a railroad to connect the settlements to be formed in the mountains with those along the Missouri River; and that, as a national route for a Pacific railroad, leading to the South Pass or to Bridger's Pass, it is superior to any other in this latitude. These conclusions appear to be fully sustained by the facts advanced in their support.

The 4th part of the report treats of the Indian tribes, their number, location, &c. An approximate estimate of their strength is made, and routes by which to operate against them, in the event of hostilities, are discussed. Almost every part of the country examined is practicable for the operations of cavalry; and routes practicable for the wagons of a military expedition can generally be found, even in the Black Hills, to such points as would be used as depots from which supplies for brief periods could be furnished for military movements.

The 5th part of Lieutenant Warren's report is a brief statement of the meteorological phenomena of the country, as observed during the explorations; the most prominent facts respecting which are the extreme variableness of the phenomena of moisture and temperature—facts which confirm previous statements in regard to them.

The report contains a catalogue of the fossils collected, with the localities of the specimens, and similar lists of the plants and the collections in the different departments of zoology. All these collections were made without interfering with the more immediate practical objects of the explorations, and reflect credit on the labors of Lieutenant Warren and his assistants. These collections are esteemed to be of high scientific value; and among the discoveries due to the labors of the expedition are the discovery of the Potsdam sandstone, the oldest of the fossiliferous rocks in the Black Hills, the first positive proof of the existence in America of the formation corresponding to the Jurassic of Europe, and the discovery on the Niobrara of a new formation of the Pliocene Tertiary, containing the remains of an extinct fauna resembling that now inhabiting Asia, from which at least thirty-two distinct species of vertebrates have been described by Professor Leidy. The principal of these results have been published, by permission of the Department, in the proceedings of the Academy of Natural Sciences of Philadelphia. Accompanying one of these papers, prepared by Dr. Hayden, is a small geological map of Nebraska.

A military map of Nebraska and Dakota, on a scale of $\frac{1}{1200000}$, prepared by Lieutenant Warren, and ordered to be engraved by the Senate at its last session, is now ready for publication.

The completion of the exploration of the interior of Nebraska, about the sources of the Yellowstone, Lieutenant Warren thinks could be most advantageously and economically made by an expedition organized to remain at least two years in the field, and the cost of this he estimates at $60,000. This exploration has been a favorite object with him, and his previous experience, and his knowledge of the Indians and character of the country, would enable him to accomplish the work with economy.

The highly creditable manner in which the explorations heretofore intrusted to him have been conducted, under many embarrassments, difficulties, and dangers, prove him to be peculiarly well qualified for the task.

A detailed plan for the execution of the work will be found in the report.

* * * * * * *

EXPLORATIONS IN NEBRASKA AND DAKOTA.

PRELIMINARY REPORT OF LIEUT. G. K. WARREN, TOPOGRAPHICAL ENGINEERS, TO CAPT. A. A. HUMPHREYS, TOPOGRAPHICAL ENGINEERS, IN CHARGE OF OFFICE OF EXPLORATIONS AND SURVEYS, WAR DEPARTMENT.

WASHINGTON, D. C., *November* 24, 1858.

CAPTAIN: I have the honor to submit the following preliminary report on the results of the explorations conducted by me in Nebraska in the years 1855,-'56,-'57. This report is divided as follows:

1st. Routes explored, and main incidents affecting their direction and extent;

2d. Physical geography of Nebraska, character of the soil, and resources of the country;

3d. Remarks upon the climate and meteorology;

4th. A description of the principal rivers, and discussion of the merits of different routes; and

5th. An enumeration of the Indian tribes, military posts, and routes for military operations.

To the report is annexed a small map of Nebraska on a scale of 1 to 6,000,000, showing the main physical features of the country and the routes requiring further examination, as well as those already explored. The report is accompanied by catalogues of the paleontological, mineralogical, botanical, and zoological specimens collected on our explorations, prepared by Dr. F. V. Hayden, so as to show the localities where they were found. Much useful instruction as to the manner of making meteorological observations and collecting specimens in natural history was given to us by the officers of the Smithsonian Institution, and the Secretary, Professor Henry, furnished us with rooms in which to store the collections and elaborate the results. A brief report, by Dr. Samuel Moffitt, of the health of the party during the expedition in 1857, is also appended.

We have found it necessary to defer to a subsequent report the narrative and itinerary of the routes, the complete maps, profiles, and other illustrations, the tables of meteorological observations, and the results of our collections and observations in geology, botany, &c.

Some of the geological results have already been published by permission of the War Department in papers read by Dr. Hayden, Mr. F. B. Meek, and Dr. Joseph Leidy, before the Academy of Natural Sciences of Philadelphia. A letter prepared by me for the Hon. G. W. Jones, Senator from Iowa, has also been published, accompanied by a small map of Nebraska, on a scale of 1 to 6,000,000. This map has also been colored so as to indicate approximately the geological formations, and in this shape is published with one of the papers prepared by Dr. Hayden in the Proceedings of the Academy of Natural Sciences of Philadelphia.

A map of my explorations in Nebraska was ordered to be engraved, by the United States Senate, during the last session, and is now nearly ready for publication. In preparing this map I availed myself of all other explorations and surveys within the limits comprised by it, (in-

cluding thus some late unpublished maps kindly furnished from the Interior Department,) an acknowledgment of all of which is made thereon. It was necessary to indicate on this map a considerable portion of the country not examined by me in order to give it the greatest practical value, and to show the relation of the parts I have explored to those surrounding them. My design was to make the map a complete representation of all the region occupied by the Dakotas, and the best routes by which to approach and traverse it, and along which to conduct military operations to the best advantage; in other words, to make it a "Military Map of Nebraska and Dakota," which is the title I have given it. It is on a scale of 1 to 1,200,000, and embraces all the country from the 94th to the 106th meridian, between the 38th and 50th parallels. In its northeast corner is the Lake of the Woods, in the southeast Fort Leavenworth, in the southwest Pike's Peak, and in the northwest the junction of Milk River with the Missouri. A number of rivers are put down on this map which have never yet been explored, except at their mouths; these are the Knife River, Heart River, Cannon Ball River, and Moreau River. As the expeditions under my command have gone almost around the section through which they flow, and determined with a great degree of certainty that it is an open prairie, and have gained some knowledge of their lengths and directions from the Indians, they are probably represented with a considerable degree of exactness.

On the small map accompanying this report the southern branches of the Yellowstone River have also been represented with an approximation to correctness, by using information furnished by the expeditions of Captains Lewis and Clark, and Captain Bonneville, and also from sketches, &c., obtained by me from traders and trappers. This section of country, however, has much practical importance in relation to routes through it by which to reach Utah from the navigable parts of the Missouri and Yellowstone, and deserves a thorough exploration. This examination I have always had a great desire to make, and in my previous expeditions have taken much pains to ascertain the best means of conducting it. In this I have been fortunate in meeting with Mr. James Bridger, Mr. Alexander Culbertson, Mr. Robert Campbell, and others well acquainted with the character of the country from personal experience, and have the assurance of the services of Mr. Bridger if the exploration should be ordered.

On account of the great distance of the region to be examined from the settlements, it is necessary to provide the expedition with the means for remaining two summers, the intervening winter to be passed at some suitable point on the Yellowstone or Big Horn rivers. It would be difficult for an expedition to do more than go and return in the same season, so that then little or no time would be allowed to explore. The country is principally occupied by the Crow Indians, and, as I know them to be friendly, I think a military escort can be dispensed with, which is a material consideration under the present excessive requirements of the military service. The method I propose instead is, to go well provided with goods and presents by which to purchase of the Indians permission to pass through the country, and to employ them as guides. In this way much expense can be prevented, and, with prudent management, danger to the expedition can be avoided; besides, valuable information will be gained from the Indians which would be withheld if we entered their country in a hostile attitude.

The expedition should be completely organized and equipped for the field by the 1st of May, 1859, and remain in the field until the 1st of December, 1860, nineteen months.

There should be thirty men, at $30 per month, and eight assistants, as topographers, collectors, guides, &c., at $125 per month. This would require $38,000. Their provisions would cost about $7,000. Animals and outfit $10,000. Indian goods $4,000. Contingencies $3,000. Total $60,000. Of this amount about $35,000 would be required the first year. The bulk of the stores and goods required should be contracted for, to be delivered at Fort Laramie or the Platte Bridge.

The expedition itself should proceed by the Missouri River to Fort Pierre, where the necessary animals for a pack train should be assembled. At this point we should meet with some of the principal men of the Dakotas, and overtures should be made to secure their assent to our proceeding westward up the Shyenne and its North Fork, and thence to the source of Powder River, thus exploring a new route. Should this consent be withheld, and it should not be considered safe to proceed without it, the party could take the route by way of White River to Fort Laramie and thence to the source of Powder River. The exploration should then be conducted along Powder River to its mouth, thence up the Yellowstone to the mouth of Tongue River, up which stream a detachment should be sent to its source. The remainder of the party should ascend the Yellowstone to the mouth of Big Horn River, and up this latter stream to the point where it leaves the mountains, where it should be joined by the detachment which explored Tongue River.

The approach of winter might require the party to pass that season in this neighborhood, or, if time sufficed, the expedition might ascend the Big Horn River to Wind River, where a very favorable wintering place could be found. Either of these places would be sufficiently convenient to the supplies on the Platte. Under circumstances not foreseen it might be best for the expedition to winter near Fort Laramie.

The next season should be spent in examining the mountain region about the sources of the Yellowstone and Missouri, to ascertain the character of the routes leading south and west from the navigable parts of these rivers. On returning, one portion should descend the Missouri, the other the Yellowstone, to their junction, where a Mackinac boat should be in readiness, by which all could proceed to the settlements.

These explorations would determine the practicability of all the routes marked on the accompanying map as deserving examination, and would require much activity on the part of those conducting them. Pack trains should alone be used, as wagons greatly retard the operations of a party and vastly increase the difficulty of defending it against attack. The abundance of game in much of this region would render it unnecessary to provide the usual quantity of bread and bacon, which always make the bulk of the provisions required.

The party must be well prepared for defense against war parties, and it would be desirable to arm each man with a revolver, and about three-fourths of them, in addition, should have a double-barreled gun, one rifled, the other smooth. This is a most effective gun either for hunting or fighting.

Copies of my instructions from the Hon. John B. Floyd, Secretary of War, dated May 6, 1857, and from Brevet Brigadier-General W. S. Harney, dated June 3, 1856, are transmitted herewith.

Very respectfully, your obedient servant,

G. K. WARREN,
Lieutenant Topographical Engineers.

Capt. A. A. HUMPHREYS,
Corps of Topographical Engineers,
In charge Office Explorations and Surveys.

WAR DEPARTMENT,
Washington, May 6, 1857.

SIR: Under the appropriation "for surveys for military defenses, geographical explorations, and reconnaissances for military purposes," you will organize an expedition to ascertain the best route for continuing the military road between Fort Snelling and the mouth of the Big Sioux to Fort Laramie and the South Pass, by way of the Loup Fork of the Platte; to make also such explorations in the Black Hills, about the sources of the Shyenne and Little Missouri rivers, as the time and means will permit; and to examine the Niobrara or l'Eau qui Court River, upon your return route, for the purpose of ascertaining its character and resources and the practicability of locating a road along it, leading from the Missouri River to the South Pass, or from Fort Randall to Fort Laramie.

The sum of twenty-five thousand dollars is set apart from the appropriation to defray the expenses of the expedition, which amount your expenditures must not exceed.

The commanding general of the Department of the West will be directed to detail an escort of thirty enlisted men of the infantry, under the command of a second lieutenant, who will report to you for duty.

Transportation for the provision and equipage of the escort, their subsistence, and their necessary ammunition, will be furnished, respectively, by the Quartermaster's, Commissary, and Ordnance Departments.

Upon the proper requisitions, officers of the Quartermaster's and Commissary Departments at the military posts near the routes pursued by the expedition will furnish, as far as practicable, all necessary supplies for it, which, when required for the civil employés, shall be paid for at cost prices at the places of delivery, from the appropriation for the survey.

Twenty Colt's revolvers, of the Navy pattern, with belts, holsters, and the necessary ammunition, will be furnished by the Ordnance Department; those lost or damaged being paid for out of the appropriation for the survey.

All other arms and ammunition for the civil employés (guides, hunters, herders, &c.) of the expedition will be paid for from this same appropriation.

You are authorized to employ as assistants—

	Per month.
A topographer, at a salary not to exceed	$130
One assistant topographer, at a salary not to exceed	100
An assistant astronomer, at a salary not to exceed	125
A physician and geologist, at a salary not to exceed	125
An assistant physician and geologist, at a salary not to exceed	100
A meteorologist, at a salary not to exceed	60

And to pay their actual traveling expenses to and from the field of operations.

You will procure your employés equipment, supplies, &c., at those points which appear to insure the most economical and effective organization for your party, and prepare to take the field at the earliest possible moment. While in the field, attention will be given to ascertaining everything relating to the agricultural and mineralogical resources of the country, its climatology, its topographical features, and the facilities or obstacles which these latter offer to the construction of rail or common roads.

You will communicate with the Department through the Office of Explorations and Surveys, in charge of Capt. A. A. Humphreys, Corps

Topographical Engineers; and to this office you will make the reports and returns required by regulations of an officer of engineers in charge of a work or operation, and such other reports, transmitted as often as the means of communication will allow, as will keep the Department apprised of all your movements, and the progress of the expedition under your charge.

On the completion of the field duty, you will return, with your assistants, to Washington, and there prepare the maps and reports necessary to a full exposition of the results of the expedition.

Very respectfully, your obedient servant,

JOHN B. FLOYD,
Secretary of War.

Lieut. G. K. WARREN,
Corps Topographical Engineers.

[Special Orders No. 26.]

HEADQUARTERS SIOUX EXPEDITION,
Camp near old Fort Lookout, Missouri River, June 3, 1856.

I. As it is important to obtain reliable information of the Missouri River, from Fort Pierre to some point above the mouth of the Yellowstone, near which Governor Stevens' route strikes it, Second Lieutenant Gouverneur K. Warren, Topographical Engineers, is assigned to this duty, and will proceed with his party by the steamer St. Mary's to the point above indicated.

On his return, Lieutenant Warren will procure a sufficient number of Mackinac boats, for the transportation of his party, stores, &c., to enable him to effect a thorough examination of this part of the river.

II. The commanding officer of the Second Infantry will select an efficient party from his regiment, consisting of two non-commissioned officers and fifteen men, to report to Lieutenant Warren as his escort. They will be furnished with three months' provisions, equipage, &c.

III. The assistant quartermaster at Fort Pierre will furnish the necessary transportation, and such supplies as Lieutenant Warren may be entitled to from his department, for the proper execution of these instructions.

By order of Brevet Brigadier-General Harney.

A. PLEASONTON,
Capt. Second Dragoons, Acting Assistant Adjutant-General.

REPORT.

CHAPTER I.

ROUTES EXPLORED, AND MAIN INCIDENTS AFFECTING THEIR EXTENT AND DURATION.

In presenting the following report of explorations in Nebraska, made by me in the year 1857, I shall include also my previous reconnaissances in that Territory in the years 1855–'56, while attached to the staff of Brevet Brigadier-General W. S. Harney, commanding the Sioux expedition. As, at this time, a complete narrative of these cannot be made, I shall only mention the routes pursued and the nature of the examination, and then give what I consider the most prominent results.

A report of the explorations made in 1855, and map of the routes pursued by the Sioux expedition, have already been published by the United States Senate in a small document called "Explorations in the Dacotah Country." During that year routes were examined from Fort Pierre to Fort Kearney; from Fort Kearney to Fort Laramie, along the Platte River; from Fort Laramie to Fort Pierre; and from Fort Pierre to the mouth of the Big Sioux River.

In 1856 I started from Saint Louis for Fort Pierre, in the middle of April, accompanied by my assistants, Messrs. W. H. Hutton, J. H. Snowden, and F. V. Hayden, on board Captain Throckmorton's steamboat Genoa. During our passage up the Missouri we made a careful sketch of the river above the southern boundary of Nebraska by means of compass courses, and distances estimated from the rate of travel of the steamboat, and by astronomical observations for latitude. The elevated position of the pilot-house of the steamboat, which the politeness of the captain allowed us to occupy, afforded advantages for gaining a knowledge of the river, the extent of the sand-bars, and the size and quantity of timber on the banks, the nature of the bottom lands as regards marshes, &c., not equaled by those of any other means of reconnaissance, and the topographer at the same time could avail himself of the extensive and accurate knowledge of the pilot. Our observations, by means of forward and back sights, showed us that the effects of local attraction on the compass by the iron on the boat were not important, and the checks on the estimated distances, afforded by the results of observations for latitude, proved that these estimates were very accurately made by Messrs. Hutton and Snowden, who, by turns, prepared the sketch of the river.

As far up as the mouth of James River our advance had been quite rapid, the river being at a good stage; but a short distance above that point we encountered a sudden and heavy freshet in the river, (produced by rains,) with a current so rapid that our boat was unable to advance against it. From this cause we remained tied up to the bank a whole day. As soon as the river began to fall the velocity abated, and we proceeded on the voyage. So sudden, however, was the subsidence of the flood that, in five days after we had escaped the embargo of too much water, we found oursèlves aground and drawing several

inches more water than there was anywhere on the bar, which stretched across the river. This occurred to us near the first Cedar Island.

Under these circumstances, being anxious to reach Fort Pierre as soon as possible, as was also Captain Frost, (who was sutler at the fort, and whose goods were the principal freight of the boat,) we determined to leave the boat and proceed on foot to the dragoon camp, at the mouth of American Crow River, about eighty miles distant. Our means of transportation were two horses, the property of Colonel Lee, Second Infantry, and Lieutenant-Colonel Andrews, of the Sixth Infantry, which carried our blankets and provisions; and we were accompanied by a Mr. Moore and two men. On arriving opposite to the dragoon camp on the evening of the third day's travel, we were informed that there was no boat to bring us across. We stayed on the bank of the river that night, and the next morning renewed our signals to communicate with the camp. These, however, failed to attract attention to us, and, our provisions being short, we were obliged, though much wearied by our journey on foot, (there having been a cold rain one day and night,) to attempt to reach Fort Pierre, eighty miles distant. This we accomplished in three days, and arrived there on the 20th of May, completely exhausted, having subsisted mainly on the birds killed with our shot-guns. The journey gave me an opportunity of viewing the country and its appearances a few miles back from the Missouri.

The steamboat, having landed a portion of her freight at the place where we left her, reached Fort Pierre three days after us. On my arrival all the tribes of the Dakotas west of the Missouri, except the Sichangus and Ogallalas, were assembled in council, and a treaty of peace was made with them by General Harney, which terminated the Sioux war.

Instructions were now given me by General Harney to proceed with my party in the American Fur Company's boat to the mouth of the Yellowstone, and as far above as she should ascend, and to return by means of a Mackinac boat, and carefully examine all points on the river to determine their suitability as sites for military posts, and to obtain such other information as we should be able with regard to the country. An escort of fifteen men and two non-commissioned officers of the Second Infantry were placed under my command. We left Fort Pierre in the American Fur Company's boat "St. Mary," Captain Labarge, on the 28th of June, and reached Fort Union on the 10th of July. The boat landed most of her stores, and then proceeded to a point about sixty miles above the mouth of the Yellowstone and discharged the balance.

While ascending the river, the sketch of it was taken above Fort Pierre, as it had been below, by Messrs. Hutton and Snowden, and observations were made by me for latitude. At Fort Union a 16-inch transit was set up, and observations taken during a whole lunation; but owing to the cloudy condition of the nights during the time, and the shortness of the nights themselves, only two sets of observations were obtained on the moon and stars. The result of these gave the longitude of that post 104° 02′, with a limit of error of about 10′.

While at Fort Union we saw the Assinniboin Indians.

Having ascertained that a Mackinac boat could not be prepared for me before the 1st of September, I determined to make an examination of the Yellowstone during the month of August; and in carrying this out I was fortunate in being able to purchase the means of land transportation from Sir George Gore, who was returning from an extensive hunting excursion on the waters of the Yellowstone and its branches. We left the mouth of the Yellowstone July 25, and, traveling leisurely

up the left bank, reached a point one hundred miles from its mouth, beyond which it was impossible to advance with wagons along the valley of the Yellowstone without crossing to the opposite banks. Here we made a camp with the main body, and with a party of seven I proceeded, with pack animals, over a very difficult country (known as the Bad Lands of the Yellowstone) to the mouth of Powder River, thirty miles further.

This was the furthest point up the Yellowstone that I intended to proceed, and I was anxious to reach it and to fix its position, as being a good and certain point with which any future reconnaissance could connect. From the appearance of Powder River at the mouth, no one would suppose the stream to be of the length it really is, and I was not surprised at Captain Clark not having done so on his voyage down the Yellowstone in 1806. On returning to our wagon camp, we all traveled a short distance down the Yellowstone to a convenient point, where we made a boat eighteen feet long and five feet wide, by stretching the skins of three buffalo bulls over a frame made of small cottonwood and willow trees. With this vessel a small party navigated the Yellowstone to its mouth, carefully mapping the islands and bends of the river. The wagons and land party returned to the Missouri by traveling over nearly the route by which they ascended.

We enjoyed the greatest abundance of large game of all kinds while on the Yellowstone River.

On reaching Fort Union again we found our boat nearly ready, and, all our arrangements being completed, we left that place on the 1st of September. A small party conducted the animals along the shore on our journey down the Missouri, generally camping each night with the boat party. Halts of two or three days were made at all interesting localities, and map sketches were made several miles up all the streams flowing into the Missouri; and the map of the Missouri was also verified. These sketches, on a scale of one and a half inch to a mile, are on file and convenient for reference in this office.

Thermometer and barometer observations were made throughout the period of the examinations of the year 1856. Dr. Hayden was indefatigable in his efforts to develop the geology of the region traversed, and some of the results have already been published, by permission of the War Department, in the Proceedings of the Academy of Natural Sciences in Philadelphia. A very extensive collection was also made in zoology.

We reached Fort Pierre on our return on the 2d of October, at which place our animals were sold, and most of the soldiers returned to their respective companies. A few accompanied us as far as the mouth of the James River. We reached Sioux City on November 15, and fortunately found a steamboat there, by means of which we proceeded with our effects to Saint Louis, and thence by railroad to Washington. The cost of this expedition to the United States was about $10,000.

No special report has yet been made by me on the results of this year's exploration. The maps were about completed, and the material in the process of elaboration, when I was assigned to the command of another exploration by the War Department, a brief account of which I shall now proceed to give.

I received my instructions from the Hon. John B. Floyd, Secretary of War, May 7, 1857, the general terms of which were to make the necessary examinations to determine the best route for continuing the military road between Mendota and the Big Sioux westward to Fort

Laramie and the South Pass; thence to proceed northward and make such examinations on the Black Hills as my time and means would permit, and to return by the valley of the Niobrara, and make a careful examination thereof. I was assisted in the examination by Messrs. J. H. Snowden and P. M. Engel, as topographers; Dr. F. V. Hayden, as geologist; W. P. C. Carrington, as meteorologist; Dr. S. Moffitt, as surgeon; and Lieut. Jas. McMillan commanding the escort.

The escort, numbering twenty-seven men and three non-commissioned officers, under Lieutenant McMillan, all of the Second Infantry, was directed to meet me at Sioux City, transportation for it being furnished by the Quartermaster's Department. Transportation for the remainder of the party was assembled at Omaha City as soon as possible; and on the 27th of June, under the charge of Mr. Snowden, set out for the rendezvous at the mouth of Loup Fork.

Accompanied by Mr. Engel, I then proceeded to Sioux City, where we found the escort had been awaiting us several days on the Big Sioux River. Through some misunderstanding there were no teamsters furnished for the wagons of the escort; and the mules, from a disease of the hoof, and the wagons, and especially the harness, from long use, were of very inferior quality. It occupied me six days in getting the train in traveling condition, which was only done by abandoning one wagon and a large supply of stores for the escort. During this time a rumor* reached there of a fight having taken place between the soldiers and the Shyennes at Ash Hollow, in which a hundred of the former were killed. Twelve of the soldiers of the escort, tempted by the high prices of labor in this vicinity, and tired of the toils and privations of campaigning, deserted as we were about to set out, and some white thieves who infested the neighborhood of Sioux City carried off two of my best horses. These losses occurring in a civilized community, where we supposed ourselves among friends, were quite annoying, and gave rather unpleasant forebodings of what might occur to us when we should come among our enemies, the Indians.

We set out from Sioux City July 6, and, taking a direct course, joined the other party on the Loup Fork, being 11 days in going 110 miles. The route was heavy from frequent rains, all the ravines being filled with water, and the most insignificant rivulet requiring preparation, on account of the soft nature of the soil, before a wagon could cross it. We had to make one bridge (over Middle Creek) about 30 feet long, and construct a raft with which to cross the Elk Horn.

The united party now set out on their journey westward on the Loup Fork, meeting with no serious difficulties on the route (except the quicksands in crossing the main north branch) till we came to within 50 miles of the source of the stream. Here the river became shut up in a gorge impassable for wagons, and we were forced out among the difficult sand-hills which border the bluffs, and which extend north to the Niobrara and south nearly to the Platte. They also extend much further east, but they occasioned us no difficulties till we were forced to leave the bank of the stream.

We finally came to the source of the Loup Fork, and from this point endeavored to proceed as directly as possible north to the Niobrara, for we were somewhat apprehensive of losing everything, for want of water, by endeavoring to push our way westward through the Sand Hills. These hills, however, were so impracticable for wagons that we were forced much more to the west than we desired, and one day we were unable to find water to camp by. There are numerous lakes in this Sand

* This rumor was without foundation, as it afterwards appeared.

Hill country, but many of them are too much impregnated with salts to be wholesome. Some of these latter our animals drank out of without injury. On reaching the longitude of 102° 30′ we had the good fortune to find an open stretch of country, with a large, well-marked lodge-trail leading between the Platte and Niobrara, which, in one day's travel northward, brought us to the Niobrara. We now proceeded rapidly over an easy route to Fort Laramie.

During the journey there had been considerable sickness in the camp from fevers, and one of the men was so near the point of death that a halt of several days was made for his benefit. Dr. Moffitt also became so ill as to require a delay of one or two days. These necessary stoppages, the difficulties of the route, rainy weather, together with my being obliged to leave so much of our provisions behind at Sioux City, reduced our supplies to a small amount, and for nearly two weeks we were without sugar or coffee. We had also been very much disappointed in the amount of game; and though the country gave evidence of having recently been occupied by large herds of buffalo, only a few bulls were seen. During the early part of the journey, mosquitoes were abundant, and allowed our animals no rest at night, and immense numbers of flies attacked them by day. These insects, combined, exhausted and worried the animals more than the labor they performed, and the lives of one or two were saved only by covering them with grease and tar to keep the flies and mosquitoes away.

At Fort Laramie we entirely refitted the party, which took us a long time, on account of everything being required for the Utah expedition. It gives me great pleasure to state that the commanding officer, Colonel Hoffman, and the acting quartermaster, Lieutenant Higgins, gave me all the facilities at their command. Owing to the great number of animals that graze in the neighborhood, the grass was nearly eaten off, and our animals recruited very little during our stay there. While there I succeeded in getting several sets of observations for moon culminations, which determined the longitude to be 104° 30′, with a limit of error of about 4′. Dr. Hayden and Mr. Engel also made an excursion to Laramie Peak, which they ascended.

The party, on leaving Fort Laramie, was divided into two parts, as, owing to the lateness of the season, it was impossible to accomplish all the objects of the expedition by keeping together. Though in doing this I subjected each portion to the possibility of being defeated by the Indians, I deemed the case to justify the risk. The wagons were, half of them, turned in to the quartermaster, and the remainder, with the escort under Lieutenant McMillan, were to proceed down the Niobrara, and await me in longitude 101° 30′. Mr. J. H. Snowden went with this party to make the topographical reconnaissances; Dr. Moffitt also accompanied it. My own party consisted of Dr. Hayden, Mr. Carrington, and Mr. Engel, and we had with us 17 men as packers, &c., and Mr. Morin as a guide and interpreter. Our supplies were packed on mules.

Setting out from Fort Laramie on the 4th of September, we proceeded direct for the Black Hills via Raw Hide Butte, Old Woman Creek, the South Fork of the Shyenne, and Beaver Creek; up a branch of this last we entered the Black Hills. We continued north to the vicinity of the Inyan Kara, (or the peak which makes the mountain,) a remarkable high basaltic peak, one of the highest of these mountains, and so far to the north that we had a full view of the prairie beyond.

Here we were met by a very large force of the Dakotas, who made such earnest remonstrances and threats against our proceeding into their country that I did not think it prudent for us, as a scientific expe-

dition, to venture further in this direction. Some of them were for attacking us immediately, as their numbers would have insured success; but the lesson taught them by General Harney, in 1855, made them fear they would meet with retribution, and this I endeavored to impress upon them. We were at the time almost in sight of the place where these Indians had plundered Sir George Gore in 1856, for endeavoring to proceed through their country, and one of them was actually mounted on one of his best horses, taken at that time. Sir George Gore's party was only about half as numerous as mine; but there were a number of my party which I had picked up at Fort Laramie on whom we placed very little reliance.

The grounds of their objections to our traversing this region were very sensible, and of sufficient weight, I think, to have justified them in their own minds in resisting; and as these are still in force for the prevention of the passage of any other party of whites not large enough to resist successfully, they are of sufficient importance to be repeated here. In the first place, they were encamped near large herds of buffalo, whose hair not being sufficiently grown to make robes, the Indians were, it may be said, actually herding the animals. No one was permitted to kill any in the large bands for fear of stampeding the others, and only such were killed as straggled away from the main herds. Thus the whole range of the buffalo was stopped so that they could not proceed south, which was the point to which they were traveling. The intention of the Indians was to retain the buffalo in their neighborhood till their skins would answer for robes, then to kill the animals by surrounding one band at a time and completely destroying each member of it. In this way no alarm is communicated to the neighboring bands, which often remain quiet almost in sight of the scene of slaughter.

For us to have continued on then would have been an act for which certain death would have been inflicted on a like number of their own tribe had they done it; for we might have deflected the whole range of the buffalo fifty or one hundred miles to the west, and prevented the Indians from laying in their winter stock of provisions and skins, on which their comfort if not even their lives depended. Their feelings toward us, under the circumstances, were not unlike what we should feel toward a person who should insist upon setting fire to our barns. The most violent of them were for immediate resistance when I told them of my intentions; and those who were most friendly, and in greatest fear of the power of the United States, begged that I would "take pity" on them and not proceed. I felt that, aside from its being an unnecessary risk to subject my party and the interests of the expedition to, it was almost cruelty to the Indians to drive them to commit any desperate act, which would call for chastisement from the Government.

But this was not the only reason they urged against our proceeding. They said that the treaty made with General Harney gave to the whites the privilege of traveling on the Platte and along White River, between Forts Pierre and Laramie, and to make roads there, and to travel up and down the Missouri in boats; but that it guaranteed to them that no white people should travel elsewhere in their country, and thus frighten away the buffalo by their careless manner of hunting them. And, finally, that my party was there examining the country to ascertain if it was of value to the whites, and to discover roads through it, and places for military posts; and that having already given up all the country to the whites that they could spare, these Black Hills must be left wholly to themselves. Moreover, if none of these things should

occur, our passing through their country would give us a knowledge of its character and the proper way to traverse it in the event of another war between themselves and the troops. I was necessarily compelled to admit to myself the truth and force of these objections.

The Indians whom I first met were the Minikanyes, to the number of forty lodges, near whom, as they were very friendly, we encamped.* They were soon joined by the warriors of a large camp of Unkpapas and Sihasapas, and our position, which was sufficiently unpleasant in the presence of such a numerous party of half-avowed enemies, was rendered doubly so by a storm of sleet and snow, which lasted two days and nights, and against which we had but little protection.

A young Indian, who had accompanied us from Fort Laramie, considered the danger to us so imminent that he forsook our camp and joined his friends, the Minikanyes.

Under these embarrassing circumstances my associates evinced the most resolute bravery and determination to abide the result like true men.

I consented to wait three days without advancing, in order to meet their great warrior, Bear's Rib, appointed first chief by General Harney's treaty, merely changing our position to one offering greater facilities for defense. At the expiration of the time, Bear's Rib not making his appearance, we broke up camp, and, traveling back on our route about forty miles, struck off to the eastward, through the southern part of these mountains. The point where we turned back is well marked by the Inyan Kara Peak, whose position was fixed by us.

After we had proceeded two days on our journey eastward, we were overtaken by Bear's Rib and one other Indian who accompanied him. He reiterated all that had been said by the other chiefs, and added that he could do nothing to prevent our being destroyed if we attempted to proceed further. I then told him that I believed he was our friend, but that if he could do nothing for us, he had better return to his people, and leave us to take care of ourselves, as I was determined to proceed as far as Bear Butte. After a whole day spent in deliberation, he concluded to accompany us a part of the way, and he said he would then return to his people and use his influence to have us not molested. In return for this, he wished me to say to the President and to the white people that they could not be allowed to come into that country; that if the presents sent were to purchase such a right, they did not want them. All they asked of the white people was, to be left to themselves and let alone; that if the presents were sent to induce them not to go to war with the Crows and their other enemies, they did not wish them. War with them was not only a necessity but a pastime. He said General Harney had told them not to go to war, and yet he was all the time going to war himself. (Bear's Rib knew that when General Harney left the Sioux country he had gone to the war in Florida, and was at the time in command of the army sent against the Mormons.) He said, moreover, that the annuities scarcely paid for going after them; and that if they were not distributed to them while they were on their visit to the trading-posts on the Missouri to dispose of their robes, they did not want them.

(It is a fact that for several years, owing to this cause, these Indians have not come in for their goods at all.)

He said that he heard that the Ihanktonwans were going to sell their

* I am much indebted to the influence of Major Twiss, the Indian agent near Fort Laramie, for his efforts to give the Dakotas a favorable opinion of my expedition, and to secure us a friendly reception.

lands to the whites. If they did so, he wished them informed that they could not come on his people's lands. They must stay with the whites. Every day the Ihanktonwans were coming there but were always turned back.

Whatever may have been Bear's Rib's actions after leaving us, it is certain we saw no more Indians in the Black Hills. We completed our reconnaissance along the eastern portion of these mountains as far as Bear Peak, which forms another convenient and accurate point with which any future reconnaissance may connect with our own. We also visited the North Fork of the Shyenne, in this vicinity. On our return we took a southeast direction, striking the South Fork of the Shyenne at the mouth of Sage Creek. We then proceeded up the South Fork to French Creek; thence southeast, through the Bad Lands, to White River; thence along the sources of White Clay Creek and Porcupine Creek; and thence to the Niobrara, striking it in longitude 102° 03′.

We found the party under Lieutenant McMillan about forty miles below where we struck the river, and eighty miles below where we had first reached it on our journey westward in August. This intervening distance had been carefully mapped by Mr. Snowden, and he had made several excursions at different places to examine the country, as I had directed. Lieutenant McMillan's march down the river thus far had not been made without much wordy opposition from the Brulé Dakotas, much of the same kind as that I have related as having been said to me in the Black Hills. On finding that he was determined to proceed, the chief, Little Thunder, sent four of his principal men to accompany them, which they did for some days. At a subsequent time, twenty-two warriors charged into the camp, thinking the party was a trading-expedition. Their insolence was checked by Lieutenant McMillan's threatening to fire on them; whereupon they entered their usual protest against the party's proceeding further, and the next day all withdrew. The last twenty miles of Lieutenant McMillan's route was through difficult sand-hills bordering the river, the stream itself being so shut in by high precipitous ridges that he was unable to travel along it.

We now found the route exceedingly laborious for wagons on account of the sand-hills, which continue to the mouth of Rapid Creek. The character of the immediate valley of the Niobrara precluded the wagons from traveling along it; so, while Mr. Snowden mapped the route of the train, Mr. Engel traveled along the river, sometimes on one side and sometimes on the other, and made a map of it. Even he, though riding a mule, found it difficult to keep up in this way with the wagons, which slowly wound their way through and over the sand-hills. Our camps at night were here always on the main river. After passing the Rapid Creek, the sand-hills gave us no longer any trouble, (except for about twenty miles on the point between the Niobrara and Keya Paha,) but the ravines and precipices still prevented the wagons from traveling within from five to eight miles of the Niobrara, and here Mr. Engel continued the sketch as before. Dr. Hayden also traveled along the immediate banks of the river, examining the character of the rocks and collecting fossils.

On reaching the mouth of the Keya Paha, the main party, with the wagons, proceeded direct to Fort Randall, and a separate party, under Mr. Engel, traveled down the Niobrara to its mouth, completing the examination of that stream. It was my intention for Dr. Hayden to accompany him, but on arriving at the place of separation we found the same geological formation and characteristics as we knew to exist

at the mouth; and as the intervening distance was only sixty miles, he did not deem it necessary to go over it.

Fort Randall was reached on the 1st of November, and the escort was returned to the regiment. We were most hospitably received by Major Day, commanding the post, and the other officers of the Second Infantry, and I take this occasion to acknowledge my indebtedness to this regiment for the aid and protection they have afforded me in all my explorations.

Two sets of observations for moon culminations were obtained here, but cloudy weather prevented more. The longitude as calculated from them, is 98° 34′, with a probable limit of error of about 8′.

The party set out from Fort Randall on the 7th of November, and surveyed the route to Sioux City, which was reached on the 16th. The season being far advanced, no steamboat was expected, and the river was full of floating ice. The weather as we traveled on toward Fort Leavenworth became very severe, and the river became frozen over as far down as Saint Joseph's. During this time we made rapid progress, but a mild spell of weather coming on made the road so heavy that with the greatest exertion we hardly accomplished ten miles a day. During this time the health of the party suffered severely from influenza. We reached Fort Leavenworth on the 4th of December, and were fortunate enough to meet there with a steamboat, by which we proceeded to Saint Louis, and thence by railroad to Washington.

CHAPTER II.

PHYSICAL GEOGRAPHY OF NEBRASKA; CHARACTER OF THE SOIL AND RESOURCES OF THE COUNTRY.

Though my personal examinations have nowhere extended west of the 106th meridian, there are certain points west of it to which I would direct attention. The positions of the Missouri and Yellowstone west of this meridian and north of the 46th degree of north latitude have been well examined by Lewis and Clark and under Governor Stevens, and the valuable information they obtained is widely known. The section, however, between the 46th parallel in the north and the 43d in the south, the 106th meridian in the east, and the dividing line between the waters of the Pacific and the Atlantic in the west, is comparatively unknown, except from the accounts afforded by trapping-parties. The information given of it on the map of Lewis and Clark is derived from this latter source; as is also that on Colonel Bonneville's map, published with Irving's work on "Adventures in the Rocky Mountains," &c.; and these are our most authentic sources of information. These maps have been generally disregarded by subsequent map-makers, and previous to the map I compiled for the Pacific Railroad Office, there have been no mountains represented about the source of the Yellowstone. From inquiries I made of trappers in 1855, I became convinced of the existence of these mountains, and represented them accordingly, endeavoring to combine the information on Lewis and Clark's map and Bonneville's map with that which I had procured from traders and trappers. In doing this, I represented the Big Horn Mountains perhaps too far to the west, as they are perfectly visible from the summit of the Inyan Kara Peak, in the Black Hills.

Leaving out of consideration for the present the smaller detached mountain masses, and beginning with the main range of the Rocky

Mountains, on the 49th parallel, we find their eastern base to have a direction nearly northwest and southeast, and the range crossing the Missouri at "The Gate of the Mountains." Continuing southeast, it crosses the Yellowstone near where Captain Clark reached that river in 1806, (latitude 46,) just south of which it forms high, snow-covered peaks. This line of mountains is broken through again by the Big Horn River, and the mountains receive the name of Big Horn Mountains. The southeast terminus of the Big Horn Mountains sinks into the elevated table-land prairie, and the range, perhaps, re-appears again as the Laramie Mountains. (South of the latitude of Fort Laramie the line of the eastern front of the mountains is nearly north and south.)

The Black Hills, whose geographical position we have determined, are the most eastern portion of what has heretofore been considered a part of the great mountain-region west of the Mississippi; and it is worthy of note that, if a line be drawn from them to the Little Rocky Mountains, on the 48th parallel, which are the most eastern portion in that latitude, this line will be parallel to the line of the main front of the mountains which I have already traced. What is still more significant is, that if a straight line be drawn from the mouth of the Yellowstone to the mouth of the Kansas River, it will also be parallel to the lines before mentioned, and will have about an equal portion of the Missouri on each side of it.

The line of the east base of the main mountain mass is the highest, of course, of any portion of the plains, and at Raw Hide Peak, near Fort Laramie, is about 5,500 feet elevation, as determined by the horizontally stratified Tertiary deposits, though, owing to great denudation, the average height there of this line of the plains will not be so great. The same line, near the 49th parallel, has probably a somewhat less elevation. The lowest line of the plains is that along the Missouri, and its elevation, taken near Bijou Hills, (a point about on the perpendicular to it from Fort Laramie,) is about 2,130 feet, which does not differ materially from its height at the mouth of the Yellowstone. The slope of all this part of the plains (being in a direction perpendicular to the lines of equal elevation) has therefore its line of greatest descent in a northeast direction, and north of the Niobrara; this is the direction in which a majority of the rivers flow till they join with the Missouri or Yellowstone. To the south of the Niobrara the greatest slope of the plains is to the southeast, toward the Gulf of Mexico, and this is the direction pursued there by nearly all the rivers of the plains. Thus the Niobrara would seem, as it were, to run along a swell or ridge on the surface. The average slope of the plains from the Missouri to the mountains make nowhere an angle greater than one-half degree with the horizon.

A remarkable feature in regard to this change of slope which occurs in the neighborhood of the course of the Niobrara is the shortness of its tributaries, the surface drainage seeming to be away from and not toward its banks. A result of this is the absence of the amphitheater-like valley which rivers generally have, and which enable us to look down at the stream often many miles distant. Through the greater portion of the middle half of its course you have scarcely any indication of it as you approach, till within close proximity, and then you look down from the steep bluffs and catch, at the distance of two hundred to five hundred yards, only here and there a glimpse of the river below, so much is it hidden by the precipitous bluffs which, at the bends, stand at the water-edge. So strongly was I impressed with the fact that the surface drainage could never have been directed along its course so as to have worn out this channel, that I think a portion of

it must have originated in a fissure in the rocks, which the waters have since enlarged and made more uniform in size, and which the soft nature of the rock would render easy of accomplishment. It is worthy of remark, in this connection, that the bed of the stream in longitude 102° is 400 feet higher than that of the White River at the point nearest to this; White River having there cut its way entirely through the Tertiary formation, flows along the Cretaceous, while the bed of the Niobrara is in the Miocene Tertiary, the Pliocene forming the bluffs. The bed of the Niobrara is also, in two-thirds of its upper course, from 300 to 500 feet above the bed of the Platte River at corresponding points at the south.

In the section of the country through which the Niobrara flows the soil is very sandy, so that what rain or snow falls sinks under the surface, and none is lost by evaporation. This is gradually all poured into the stream by the springs in the ravines, and in this way the river is mainly supplied in seasons of low water, at which times it is one of the largest streams of Nebraska.

The question of the slope of the plains is a subject to which I have given much attention, from its scientific as well as practical interest. Our barometric observations have enabled us, in some measure, to fill up the gap between those of Governor Stevens on the north and Captain Frémont's on the south, and thus give us the connected levels over a very large area.

The observations upon the great Tertiary formation have developed the fact, that since the close of the Pliocene period, the eastern base of the mountains, which is the western limit of this formation, has been elevated from 2,000 to 3,000 feet above the eastern, and this without there being anywhere visible signs of upheaval, such as inclination of the strata. The only direct evidence is in the immense denudation which the Tertiary has undergone probably while this elevation was in progress, and which causes of denudation must have been gradually extinguished, as there is, at the present time, no force at work sufficient to have affected them. The evidence goes to show that the elevation which has taken place since the close of the Pliocene period has been in Nebraska remarkably uniform, and along a line in a general direction northwest and southeast, and nearly coincident with the ranges of mountains previously upheaved.

The Black Hills received their last violent upheaval at the same period as the Laramie Mountains, that is, at the close of the Cretaceous. The geological evidence goes to show that the Pliocene and Miocene Tertiary, south of the Shyenne, are fresh-water formations; yet there are no ridges now standing to mark the northern boundary to this basin. In the present relative position of the different parts of these plains, the elevation of the Pliocene Tertiary formation is now so great that much of the Black Hills and the Cretaceous on the Shyenne should have been covered with it. This might, however, have been the case, and since have all been denuded away. North of the Shyenne the Cretaceous ridges are probably sufficiently high to have separated the Tertiary beds south of it from the Lignite Tertiary to the north. But still it is necessary to suppose that this last elevation of the Tertiary has been somewhat greater near the 42d parallel than to the north of it.

A most interesting problem could be solved in regard to these changes of level, if a locality could be found where the Lignite Tertiary north of the Shyenne would be in contact with the Pliocene or Miocene beds to the south of it, as well as the more important one of the age of the first relative to the two latter.

During the time of these changes since the formation of the Pliocene Tertiary, the soft sandy material of which it was composed has been crushed and separated by denuding forces, and an area of no less than 20,000 square miles, called the Sand Hills, has been covered with barren sand, which, blown by the wind into high hills, renders this section not only barren, but in a measure impracticable for travel. The Niobrara River, lying on a most desirable line of communication, and direct in its general course, has one hundred miles of its banks obstructed with these difficult hills, and the communication between this stream and the Platte greatly obstructed and in some places entirely cut off. The subject of routes and communications I shall hereafter take up in detail.

For nearly all of the knowledge of the age of the geological formations of the portions of Nebraska developed by my explorations, I am indebted to the services of Dr. F. V. Hayden and Mr. F. B. Meek and Professor Joseph Leidy, whose papers, published in the Proceedings of the Academy of Natural Sciences, have already made known some of the principal discoveries and results due to their labors. Dr. Hayden was the only one of those mentioned who accompanied me in the field.

In the paper by Dr. Hayden, accompanying the geological map, published in June, 1858, Dr. H. observes that "a much larger surface might have been colored on the map with a good degree of confidence, but I have preferred to confine myself, for the most part, to the results of my own observations in the field." The northeast portion of the boundary of the Tertiary formation between the White and Niobrara rivers is there placed too far west, according to my own observations in 1855 and 1857. The line between this and the Cretaceous is not west of a straight line between the mouth of the South Fork of the White River and the mouth of the Keya Paha. A small portion of Tertiary should also be shown on the north side of the South Fork of the Shyenne. The great Lignite Tertiary formation most probably extends almost to the base of the Big Horn Mountains.

It is of course impossible to give correctly the relative extent of certain of the formations on a map of this scale. The width of the upheaved sedimentary formations which encircle the igneous rocks of the Black Hills is much more developed on the western than on the eastern slopes, owing to their difference in dip—on the western being quite gentle, but steep on the other, causing them soon to disappear under the Cretaceous rocks; and this is one of the most important features in the configuration of these mountains.

From what has been said it will be seen that the surface of Nebraska presents two great sections—that of the plains and that of the mountains.

The plains in this latitude are composed of nearly horizontal strata of the Tertiary and Cretaceous formations, except in a small portion of the southeast corner, where the Carboniferous is developed. Though the plains are much diversified by the effects of denuding agencies, and present in different portions striking characteristics, yet they are, as a whole, a great uniform surface gradually rising toward the mountains, at the base of which they attain an elevation varying between 3,000 and 5,500 feet above the level of the sea. The plains have three distinct portions as determined by their geological formation: 1st, the Pliocene and Miocene Tertiary; 2d, the Cretaceous; and, 3d, the Lignite Tertiary.

The *first section* extends from the southern boundary north, nearly

continuous to the 44th parallel, and contains a large portion of the valleys of the Platte, Loup Fork, Niobrara, and White Rivers. Here, except in the immediate valleys of the streams, which are composed of good soil, naturally irrigated by springs from the bluffs, or susceptible of irrigation, much of the country is sandy and unfit for cultivation. No valuable mineral or good building stone has been discovered in it. Here are to be found the Sand Hills, which occupy an area north of the Platte of not less than 20,000 square miles. These hills on the north begin between the White and Niobrara rivers, and extend south probably beyond the Arkansas. Where we have visited them, they vary in height from 10 to 200 feet, and in the western portion are ranged in ridges running east and west; but in traveling you are frequently obliged to cross them, as the intermediate valleys, which are also sand, are not continuous. About the sources of Loup Fork many of the lakes of water found in them are impregnated with salts and unfit to drink, and our sufferings in exploring them will always hold a prominent place in our memories. The present form of these hills is mainly if not entirely due to the wind. Where the grass protects the surface the sand does not drift; but if this is removed, the wind whirls the sand in the air, and often excavates deep holes. I therefore look upon them as utterly impracticable for any line of railroad; for should any attempt be made to grade the surface, which would be necessary, the wind would fill up the cuts with sand as with drifting snow.

In this section is also to be found the Bad Lands, or Mauvaises Terres, of White River, so celebrated for their vertebrate remains. The locality to which this name (Bad Lands) has been applied is in extent about one hundred and fifty miles long, in a direction northeast and southwest, and about sixty miles wide. The term "Bad Lands" was given to this section by the traders, on account of the difficulty of getting a road through a portion of it. The extent of the geological formation to which these Bad Lands belong is very great, and, as the name is an improper one to be applied to the whole of it, I shall not use the term except in speaking of the portion occupied by it along the middle course of the White River. In this part of White River some as beautiful valleys are to be found as anywhere in the Far West, though, like other parts, the majority of the country is barren. These Bad Lands of the White River country have frequently been spoken of as a vast grave or sepulchre, from the amount of bones found there; and this figure of speech has somewhat tended to give a gloomy idea of the place which it does not especially deserve, as it abounds in the most beautiful and varied forms, in endless variety, giving the most striking and pleasing effects of light and shade. It has also been described as having sunk away from the surrounding world, with the country rising like steps to the Black Hills, which is not the case, many portions of these Bad Lands being higher than all the intervening country between them and the Black Hills, from which the portions on White River are distant about thirty miles. The formation to which this portion belongs extends almost uninterruptedly east to the mouth of the Keya Paha, and south beyond the Platte; and an instance of the striking appearance which it sometimes makes is exhibited in Court-House Rock and Scott's Bluffs. The term "Bad Lands" is generally applied by the traders to any section of the prairie country where roads are difficult, and in this way to parts of many distinct geological formations, and, as it is generally calculated to mislead, should not be used. When I shall use it occasionally, I use only the name of the country, as it was originally given to mean bad land to travel through.

The *second section* is the Cretaceous formation, forming the level country at the base of the Black Hills, the valley of the Shyenne River, and the immediate valley of the Missouri River, from Heart River to the Big Sioux. In this section the soil is clayey; and wherever there is a sufficiency of rain, or streams can be found to irrigate the land, it will be productive. The great drawback to its fertility is a want of timely rains. A portion of this formation, from the Big Bend to the Shyenne, is composed of black shale, and contains much saline matter, which renders the water in places unhealthy, and adds to the sterility of the soil along the bluffs of the streams, where saline springs are common. In this section, too, there are no valuable minerals or good building stone, except that furnished by the bowlders.

The *third section*, or Lignite Tertiary, extends north and west to the British line. The want of rain, which is felt in this area even more than in the one to the south of it, renders it nearly barren. Everywhere through this formation, beds of lignite are to be found, sometimes of a thickness of 6 and 7 feet. The burned appearance of earth, along the banks of the streams, shows that in former times these beds have been on fire over large areas, and in places are entirely burned out, and those on Powder River are said to be on fire at this time. There is every reason to believe that in places this lignite will be found of quality good enough for fuel. In this section the bowlders furnish the only good building stone.

In nearly all parts of Nebraska good clay for making brick can be found.

The Carboniferous formation is developed in a small part of the southeastern portion of the prairie of Nebraska, and I will quote from the report of Dr. Hayden in relation to the coal of this section:

"The town of De Soto is the highest point known on the Missouri where these limestones are exposed. Ascending the valley of the Platte River, we find them quite well developed as far as the mouth of the Elk Horn, where they pass beneath the bend of the river, and the sandstone No. 1 occupies the country. "Several small seams of coal have been found in these limestones at Bellevue and other localities, and in the valley of the Platte. About ten miles above its mouth I noticed a bed of very dark carbonaceous shale, 2 feet in thickness, cropping out near the water's edge. This was considered by the inhabitants as a sufficient proof of the existence of a workable bed of coal in the vicinity. The evidence now points to the conclusion that though these limestones belong to the true Coal-Measures, they hold a position above the workable beds of coal, and that it is not probable a valuable seam of coal will be found north of the southern line of Nebraska. A bed of coal of inferior quality has been wrought near Leavenworth City, Kansas Territory, but it holds a lower geological position than the limestones of the southern portion of Nebraska, the dip of the strata being toward the northeast."

As our examinations were always somewhat hurried, there is room to expect that workable beds of coal may yet be found here, but at present we know of no facts against the opinion given by Dr. Hayden.

The seam of very inferior lignite found in the neighborhood of Sioux City in the Cretaceous rocks may possibly, in some places, furnish fuel of value, but where seen by us as exposed it gives but little promise. In this case, as well as the coal-seams in the Platte, mentioned above, it may be that on penetrating to the interior portions of those beds they will improve in quality.

The section of Nebraska which is now being occupied by settlers has

fertile soil, not surpassed by any portion of the prairies of the Mississippi Valley. In this eastern section will be found the fertile and wooded valley of the Elk Horn River, and all the wooded parts of the valley of the river Platte. In the southern portion of it good building stone is furnished by the Carboniferous rocks.

After passing to the west of the 97th meridian we begin to meet with sandy tracts, especially near the 42d parallel, in which latitude the sand-hills extend the furthest east. In my former report I said that but a small portion of Nebraska which I had visited is susceptible of cultivation west of the 97th meridian. I did not mean to imply that good land on these prairies would not be found west of it, for there are fertile tracts as far west as the 99th meridian, in the neighborhood of streams that are valuable, and contain wood enough to support settlements. In stating that the Territory is overspread by powerful tribes of roving savages, and is only adapted to a life such as theirs, I did not mean to imply that white men could not occupy it, but that if they ever did they would have to lead a life similar to that of the Indians, depending mainly for subsistence, not upon the buffalo, but their own herds and flocks for support; and this is most emphatically true of the region between the 99th meridian and the base of the mountains.

There is one thing concerning the longitudes of places west of the Missouri River which causes many persons to deceive themselves, and is worthy of mention here. A common idea is that the course of the Missouri is nearly south from Sioux City to Leavenworth City, and that settlers may go as far west of the one place as the other and find fertile lands. But the course of the Missouri between these points is so much to the east that Sioux City is only fifteen miles east of the meridian of Fort Riley, and Fort Randall is as far west as the western limit of the Cross Timbers on the 35th parallel.

Though the western portion of the prairies of Nebraska is not much inferior to that of corresponding meridians in Kansas and Northern Texas, there is no disguising the fact that a great portion of it is irreclaimable desert, with only a little wood and cultivable land along the streams.

The reasons for this are, 1st, an insufficiency of timely rains; 2d, over large areas the soil does not possess the proper constituents; 3d, the severity of the long, cold winters and short summers; and a 4th might be included in the clouds of grasshoppers that occasionally destroy the useful vegetation. They are nearly the same as the locusts of Egypt, and no one who has not traveled on the prairie and seen for himself can appreciate the magnitude of these insect swarms. Often they fill the air for many miles of extent, so that an experienced eye can scarce distinguish their appearance from that of a shower of rain or the smoke of a prairie fire. The height of their flight may be somewhat appreciated, as Mr. E. James saw them above his head as far as their size would render them visible while standing on the top of a peak of the Rocky Mountains, 8,500 feet above the level of the plains, and an elevation of 14,500 above that of the sea, in the region where the snow lies all the year. To a person standing in one of these swarms as they pass over and around him, the air becomes sensibly darkened, and the sound produced by their wings resembles that of the passage of a train of cars on a railroad when standing two or three hundred yards from the track. The Mormon settlements have suffered more from the ravages of these insects than probably all other causes combined. They destroyed nearly all the vegetables cultivated

last year at Fort Randall, and extended their ravages east as far as Iowa.

It must be observed, however, that good grass will generally be found all over these plains, varying in quantity and kind with different localities, and that the desert character of the country is not like that found in the deserts on Green River and Snake River, west of the South Pass, where even a sufficiency for animals cannot be found.

A very different condition of soil, water, and building-material of stone and wood, exists when we reach the mountain region.

The Black Hills, or more properly mountains, lying between the forks of the Shyenne, on the 44th parallel, between the 103d and 105th meridians, cover an area of 6,000 square miles. Their bases are elevated from 2,500 feet to 3,500 feet, and the highest peaks are about 6,700 feet above the ocean level.

The different rocks which compose these mountains, as determined by our exploration, are—

I. Metamorphosed azoic rock, including granite.
II. Lower Silurian, (Potsdam sandstone.)
III. Devonian?
IV. Carboniferous.
V. Permian.
VI. Jurassic.
VII. Cretaceous.

All the rocks below the Silurian are igneous and metamorphic, and the stratification which they exhibit stands everywhere nearly vertical, with a strike varying between northeast and northwest. So constant is this vertical dip, that it may not in reality indicate primary stratification, but some mechanical arrangement due to the molecular forces brought into existence during its cooling from the heated state. All the rocks, from the Silurian to the close of the Cretaceous, apparently lie conformable to each other. The shape of the mass is elliptical; the direction of the longest line of this or major axis being about north 20° west. On the west the rocks dip, as a whole, very gently, and at a distance of five miles from the foot of the hills the Cretaceous is apparently undisturbed, though at the base these rocks in some places stand at an angle of 45°. The manner in which this rock lies suggests the idea that the Cretaceous probably forms a considerable portion of the elevated plateau between the Black Hills and Big Horn Mountains. The dip of the upheaved rocks on the west side is as a whole very gentle, not amounting to more than from 5° to 15°, and, consequently, they are considerably developed, and form more than one-half the mountain mass composing some very high ridges. These rocks have a much greater inclination on the east side of the mountains, and soon disappear under the Cretaceous, forming a comparatively narrow belt. The east base of the mountains is from 2,000 to 3,000 feet below the western.

The rocks seem also to dip much more suddenly down on the south than on the north side. The strike of these upheaved strata is in almost every direction corresponding, on the exterior, nearly with that of the tangent to the outline of the mass, and on the interior being more nearly coincident with the direction of the major axis.

A result of this formation is that the upturned rocks break off abruptly on the side toward the interior of the mass, and leave an open valley in many places between this steep slope and the gentle one which succeeds it as we approach the interior. In these valleys the best roads are found, and one, which nearly encircles the Black

Hills, is known among the Indians and traders as the Race Course or Running Road.

The Inyan Kara Peak is basaltic, and the appearance through a powerful spy-glass of those to the north, known as the "Bear's Lodge" and "Little Missouri Buttes," indicates that they are also of this formation. More recent volcanic action is visible at Bear's Peak, and two circular spaces to the west of this peak, now occupied by muddy lakes, indicate the existence here in former times of volcanic forces.

The highest mountain masses, such as Harney's Peak, on the east side, are all granite, the rocks, as seen at a distance, appearing in the same unmistakable form as those on the Raw Hide and Laramie Peaks, namely, coarse granite or gneiss, standing in layers and slabs, indicating a vertical stratification. A full description of these mountains must be left for the final report. They derive their name from being covered with pine, whose dark green gives them a black appearance.

In reference to the Carboniferous rocks in these mountains, Dr. Hayden says:

"The exact positions in the Carboniferous system to which the limestones around Fort Laramie and in the Black Hills belong, are not sufficiently clear from the evidence yet obtained. They do not seem to be the equivalents of the beds above described along the Missouri, though they may be. The texture of the rock is quite unlike any of the limestones of the Coal-Measure with which we are acquainted, and there seems to be an absence of the fossils characteristic of the Coal-Measure limestones on the Missouri, and in Northeastern Kansas. The latest opinion, however, of my associate, Mr. Meek, is that they belong to the true Coal-Measures."

In these mountain formations, which border the great plains on the west, are to be found beautiful flowing streams, and small rich valleys covered over with fine grass for hay, and susceptible of cultivation by means of irrigation. Fine timber for fuel and lumber, limestone and good stone for building purposes are here abundant. Gold has been found in places in valuable quantities, and without doubt the more common and useful minerals will be discovered when more minute examinations are made.

I think it exceedingly desirable that something should be done to encourage settlements in the neighborhood of Fort Laramie. The wealth of that country is not properly valued, and the Indian title not being extinguished there is no opportunity to settle it. Those who live there now support themselves by trade with the Indians, which being already overdone, it is to their interest to keep others away. If the Indian title were extinguished, and the protection of the territorial government extended there, so as to be effectual, there would soon spring up a settlement that would rival that of Great Salt Lake. The Laramie River is a beautiful stream, with a fine fertile valley, and there are such everywhere along the base of the mountains. Pine timber, of the finest quality, in abundance grows there, easy of access, from which the finest lumber can be made; building stone of good quality abounds. The establishment of the military post, and the constant passing of emigrants, have driven away the game, so that the Indians do not set a high value on the land, and it could easily be procured from them.

The people now on the extreme frontiers of Nebraska are near the western limit of the fertile portions of the prairie lands, and a desert space separates them from the fertile and desirable region in the western mountains. They are, as it were, on the shore of a sea, up to which

population and agriculture may advance, and no further. But this gives them much of the value of places along the Atlantic frontier, in view of the future settlements to be formed in the mountains, between which and the present frontier a most valuable trade would exist. The western frontier has always been looking to the east for a market, but as soon as the wave of emigration has passed over the desert portion of the plains, to which the discoveries of gold have already given an impetus that will propel it to the fertile valleys of the Rocky Mountains, then will the present frontier of Kansas and Nebraska become the starting point for all the products of the Mississippi Valley which the population of the mountains will require. We see the effects of it in the benefits which the western frontier of Missouri has received from the Santa Fé trade, and still more plainly in the impetus given to Leavenworth by the operations of the army of Utah in the interior region. This flow of products has, in the last instance, been only in one direction, but when those mountains become settled, as they eventually must, then there will be a reciprocal trade materially beneficial to both.

These settlements in the mountains cannot be agricultural to the same extent as those on the Mississippi Valley, but must depend greatly upon the raising of stock. The country furnishes the means of raising sufficient quantities of grain and vegetables for the use of the inhabitants, and beautiful, healthy, and desirable locations for their homes. The remarkable freedom here from sickness is one of the attractive features of the region, and will, in this respect, go far to recompense the settler from the Mississippi Valley for his loss in the smaller amount of products that can be taken from the soil. The great want of suitable building material which now so seriously retards the growth of the West will not be felt there.

How far the fine timbers in the interior of Nebraska can be relied upon to supply settlements on the Missouri, is a question upon which I am not qualified to give a very positive opinion.

The pine extends along the Niobrara and its side ravines for about 120 miles, and there is nearly an equal extent of it on White River; but on both streams it is of inferior quality and difficult of access. That at the Black Hills is much better timber, and covers an area of about 1,500 square miles; but this is also in situations where there would be much labor in getting it out, and an Indian war would probably attend the first attempts to do so. I think the Niobrara, White, and Shyenne rivers could be used to bring the logs to the Missouri, down which they could be rafted.

The great want of timber which is felt along the settlements on the Missouri, and the high price which this material commands, may probably overcome all the difficulties I have stated to exist; and, having done this as faithfully as I can, I must leave each one to form his own opinion on the subject.

CHAPTER III.

REMARKS ON THE CLIMATE—METEOROLOGY.

The seasons I have spent in Nebraska have, as I am informed by those who have resided there a long time, been favored with an unusual supply of rain. With this caution as to the inferences which may be drawn from our observations, I will give a short account of some of the meteorological phenomena observed by us.

In the year 1855 we left Fort Leavenworth on the 15th of June, and reached Fort Pierre on the 16th of July. During the passage up the river we had 13 days of nearly calm weather; 10 days of south or southeast wind, sometimes very strong; seven thunder-storms, some of them of great violence, with much rain, the amount diminishing as we ascended the river, (there being no heavy rain after the 29th of June, all of which time we were above the mouth of the Niobrara.) The highest temperature observed was on July 15, at 2 p. m., at which time the dry thermometer gave 102° in the shade, and the wet-bulb thermometer 69°. When we reached Fort Pierre we were informed that there had been no rain or snow there for more than a year. The appearance of the vegetation confirmed this statement, as scarcely a green spot was anywhere to be seen.

Hourly observations on the wet and dry bulb thermometers and barometers were made at Fort Pierre from July 17 to 25, and at the hours of 7 a. m., 9, and 2 p. m., till August 7. The mean height of the barometric column at this place is (reduced to 32°) 28.436; the altitude above the sea, 1,500 feet. The highest temperature observed during this time was, at 3 p. m., July 22, dry thermometer, 86°; wet-bulb thermometer, 64°; the barometer, reduced to 32°, reading 28.310. On the same evening we had a heavy fall of rain, with thunder and lightning, about 5 miles south of the fort; this was the first rain experienced in the neighborhood. From July 22 to August 7 there were three violent thunder-storms from the west, one of which was attended with a heavy fall of rain. An abundance of rain continued to fall here during the summer.

While on the journey from Fort Pierre to Fort Kearny, between August 7 and August 22, we had much overcast and misty weather nearly all the time, and on seven of the days rain fell in small quantities.

From August 25 to September 12 we were on the road along the Platte River between Fort Kearny and Fort Laramie; during this time we had two heavy thunder-storms, attended with a large fall of rain. While at Fort Laramie, we had heavy frost about the 25th of September. Fort Laramie has an elevation of 4,200 feet.

From September 29 to October 19 we were on the road to Fort Pierre. The weather at times was very cold, and snow fell to the depth of four inches on the night of the 3d of October; for several days in the first part of this month the thermometer stood, at daybreak, at 29°. On the 20th and 21st of October we had a violent storm of rain, sleet, and snow, with high winds, which covered everything with ice. We were quite surprised, on reaching the neighborhood of Fort Pierre, to find the grass green and abundant, for it was such a contrast to its appearance in August, when everything seemed to have perished for want of rain. Much snow fell here during the winter, and in the spring there were heavy showers of rain, so that a more beautiful prairie country could not be found than this, as it appeared in May and June, 1856. At the same time the previous year the grasses scarce gave an indication of life.

We left Fort Pierre on the 28th of June, 1856, and reached Fort Union on the 10th of July; on the passage the weather was comparatively clear, with light winds. Up to this time no rain had fallen there, and in many places there was a great scarcity of grass. On the 15th a heavy storm of rain and wind commenced at 9 p. m., and continued till 10 p. m. on the 17th. The wind for several days previous had been light, and came from the north. On the 15th, at 2 p. m., the thermometer was at 90°, the barometer (reduced to 32°) reading 27.827. At 9 a. m., on the 16th, the barometer read 27.735; thermometer 58°. The

wind blew with great violence from the north all day on the 16th, so that it was with great difficulty we kept our tents standing; and a portion of the inclosure of the American Fur Company's fort was blown down. This storm was not accompanied by thunder and lightning. On the 17th the weather was again clear; wind light from the northeast; thermometer, at 2 p. m., 67°; barometer, 28.179. Fort Union has an elevation of 1,900 feet above the sea.

While at Fort Union and in the neighborhood we had after this abundance of rain, so that the whole landscape in August and September wore a beautiful green, and grass was plenty in places where, in July, there was not a blade of it. The highest temperature we experienced here was on the 20th of July, the thermometer, at 2 p. m., reading 93°. The earliest frost ever recorded to have occurred here was in the month of August of 1855.

We left Fort Union the 1st of September and reached Fort Pierre on the 5th of October. We were again struck with the variable nature of the climate on finding that but little rain had fallen here during our absence, and the grass had all dried up, though at this place the same period of the previous year it was everywhere green.

In the year of 1857, we started from Omaha the 28th of June, in the midst of the rainy season, and reached Fort Laramie August 20. During this journey we had fifteen rainy days, or about one in four, and on many other days there were showers with thunder and lightning near us that are not included. The highest temperature was 100°, 2 p. m., August 11.

Prior to our arrival at Fort Laramie not much rain had fallen there; but on the 22d it commenced, at 11 a. m., to rain hard, and continued with but little intermission till the 24th. This storm was not accompanied by violent wind, and the barometer gave very little indication of its approach, preserving about a reading of 25.980. No one there remembered to have ever seen so much rain fall at one time at that place.

I left Fort Laramie on the 4th of September; we had one heavy rain on the 10th, at the base of the Black Hills. While in the Black Hills we had a storm that lasted from 6 a. m. on the 16th till 9 p. m. on the 17th. As we were traveling and changed our altitude during this storm, and while it was coming on, the indications of the barometer are not of any value. Our elevation was about 5,500 feet. The storm began with a cold rain, thermometer 54°. The temperature gradually fell till the rain changed to snow during the night of the 16th, and the thermometer went down to 32°. There was a strong wind a portion of the time from the north. During the latter part of this storm we were enveloped in the clouds, and as it cleared up these gradually rose, as we could see by the line they made along the sides of the high peaks and ridges.

We experienced a very violent storm, of about twenty-four hours' duration, on the 8th of October, while on White River, and had a fall of about six inches of snow on the Niobrara on the 18th of October. From the 18th of October to the 31st, we had four storms of rain and sleet.

I have not attempted here to give the direction of the wind during the period, as it could only be done satisfactorily by copying the daily register. The prevailing wind through the year is from the north, as is fully established by the sand-hills along the Niobrara. The wind has blown these up to the brink of the precipices along the north bank, and on the south has removed them to the distance of about half a mile.

October is generally a very windy month. In 1856, fifteen days of this month, while we were traveling down the Missouri in a Mackinac boat, from Fort Pierre to Sioux City, it blew so we could not proceed. The prevailing wind at this time was from the south, and we had one violent rain-storm with a south wind.

A true indication of the nature of the climate of Nebraska is to be found in the character of the plants which grow there. Certain kinds, unable to live through the long periods of drought which occur, are rarely to be seen, and those which flourish best are such as require but little moisture, or whose roots, penetrating deep into the soil, enable them to draw a sufficiency of moisture from below. In the high prairies, where there is a good soil, we find the bunch-grass growing in tufts, but in many places interspersed with patches of cacti. The bottom lands of many of the streams support no trees but the cottonwood and willow, and some of them produce rank growths of the wild sage.

The absence of trees on all the prairie regions is another evidence of the dryness of the climate, and even in places where they can grow, as in the ravines, the excessive cold of the winter winds prevents them from reaching their full development, as is proved by the dead tops of nearly all the trees which extend their branches above the level of the prairie. The prairie fires have done much toward preventing the growth of trees in places adapted to them, but it is not a sufficient cause to account for the general absence of forests.

An interesting instance of the effect of climate on the growth of trees is to be seen in the cedar as you ascend the Missouri. At the first Cedar Island, in latitude 43, these trees grow in the bottom lands of the river, and are large and straight, those growing on the bluffs being of an inferior quality.

The cedars diminish as you ascend, and the last of these in any number together are to be seen in the bluffs opposite the mouth of the Little Shyenne, in about latitude 45, and here they are exceedingly crooked and twisted. Along the Missouri and Yellowstone, in the Lignite Tertiary formation, we find the cedar unable to support itself above the ground, and, spreading itself over the surface, presents the appearance on the hill-sides of grass or moss.

During the time I have been in Nebraska I have found everywhere an abundance of grass, except in places near the posts and others, where it had been eaten off by the buffalo.

A considerable quantity of a small variety of corn is raised by the Mandans, Rees, and Gros Ventres, near the 47th parallel, on the Missouri, and it is probable that this corn can be raised along the base of mountains as far north as the 46th parallel. The entire mountain section of Nebraska will produce good wheat, where the land can be irrigated, and the abundance of grass for pasturage will permit of the raising of immense herds of stock.

This western portion of Nebraska may, therefore, in the future be valuable for occupation for a people partly engaged in agriculture, but relying mainly upon the raising of stock.

Many valuable inferences in regard to the climate may be drawn from an examination of the catalogue of plants growing in Nebraska, prepared by Dr. Hayden, and appended to this report.

It is my intention to give tables of the meteorological observations in a subsequent report. These, besides the indication they afford of the climate of Nebraska, will be useful in aiding the determinations of the progress and limits of storms over large areas in connection with exten-

sive investigations on this subject carried on by the Smithsonian Institution, under the direction of Professor Henry.

The thunder-storms, so far as we have observed them, have a great uniformity. The day after one has passed over is generally cold, with a light north wind and high state of the barometer. This condition lasts from one to three days, when the wind changes to the south and gradually increases in force during the day, and sometimes falling almost to a calm at night. The barometer falls during the time, and cumulus clouds begin to form. After the south wind has blown three or four days, a thunder-storm comes from the west generally in the night; the south wind often blowing a hurricane all the time the storm is approaching from the west. This storm is again succeeded by cool weather and a high state of the barometer, and in general we found a sure indication of the approach or termination of a storm in the falling or rising of the barometric column. These storms as seen on the prairie have a number of independent centers, so that they often pass across the landscape to the north and south without your receiving any of the rain. They are frequently accompanied by a fall of hail and violent gusts of wind.

CHAPTER IV.

DESCRIPTION OF PRINCIPAL RIVERS AND DISCUSSION OF THE MERITS OF DIFFERENT ROUTES.

In giving a description of the character and importance of the rivers examined, it will perhaps be best to discuss at the same time the subject of routes, as they are intimately connected.

The Missouri, therefore, claims our first attention, and though it has been so repeatedly described by others, a few of its general features may be enumerated here. A detailed account of the various points we examined as locations for military posts must be reserved for the final report. This great stream has generally a uniform width from the junction with the Yellowstone to its mouth, varying from one-third to one-half a mile when the banks are full. In low water the width is much less, and dry bars of sand occupy portions of the bed, from which the water has withdrawn. In the upper part of the river where the trees do not destroy the force of the wind, the sand is blown about in the most astonishing manner, and the clouds of sand can be seen for many miles. Sand-banks are thus formed, generally at the edges of the trees on the islands and points, and which are often many feet above the level of the highest floods.

The force of these winds may be inferred from this, and from their constancy during certain months, especially in October, are of themselves one of the greatest obstacles to the navigation of the river.

The plans which these sand-banks exhibit are those of the perimeters of the islands and points on which they were formed, and not unlike those of the Indian mounds in the Mississippi Valley, which are supposed to be the remains of ancient fortifications. These banks along the Missouri have, therefore, been considered as the works of the aborigines, such, for instance, as those described and figured by Lewis and Clark as existing at Bon Homme Island. I have conclusive evidence, from personal examination, that these were formed by the wind,

and are not the work of the ancient Toltecs, as some writers have supposed.

The river has generally, in the same stages of the floods, about as good navigation on account of the depth above James River as it has at that point, but an improvement takes place below this point, in the depth of the water on the sand-bars in low stages, as you descend to its mouth.

Along the banks of the Missouri the bluffs are generally clothed with various species of trees as far up as the mouth of the Platte; above this point the timber is generally confined to the ravines and bottom lands. These bottom lands attain a width of from ten to fifteen miles after we get above Council Bluffs, which is almost continuous to the mouth of James River. Throughout this section the edges of the banks are lined with heavy cottonwood and other trees, and fuel for steamboats can now generally be found cut up and prepared for their use.

At James River the bluffs close in so that the general width of the space between is only from one to two miles all the way to the Upper Big Bend, near the 48th parallel. Here again the bottom lands become wider, and continue at a width of from three to six miles to a point about fifty miles above the Yellowstone. In this last section there is also an abundance of large cottonwood timber, and the appearance of the river is quite similar to what it is at Sioux City. After passing the Niobrara the steamboat's crew will have to cut the wood required for generating steam, and the only scarcity will be in finding dead trees at such points as the boat can land at. Abundance of fuel exists everywhere, if the wood was cut beforehand and hauled to suitable landings. The portion of the river most deficient in wood is between the mouth of the Little Shyenne and Cannon Ball rivers, but even here there is an abundance for the purposes of navigation for years to come.

One of the greatest obstructions to the navigation of the Missouri consists in the great number of snags or trees, whose roots, embedded in the channel by the caving of the banks, stand at various inclinations pointing down the stream. These obstructions are, comparatively, quite rare above the mouth of James River, but from this point down to the Mississippi it is a wonder often how a steamboat can be navigated through them. As it is they cause the boats to lie by during the night, and thus occasion a loss of nearly half of their running time. But this is not the only delay, for often on account of the wind the bends filled with snags cannot be passed, and the vessel is frequently detained for days on this account. This effect of the wind is much more seriously felt as you ascend above Council Bluffs, for the protection afforded by the trees on the banks is constantly diminishing.

Our examinations extended but sixty miles above the mouth of the Yellowstone, but the portion between this and Fort Benton was examined carefully by the parties under Governor Stevens in 1853, and the results are given in his report on the Pacific Railroad explorations. It is the almost universal opinion of those who have examined this portion of the river that it would be navigable in its best stages for light-draught boats. From our reconnaissance in 1856, I feel convinced that, notwithstanding the difficulties to navigation which exist, the Missouri is a superior river to any in this country, except that portion of the Mississippi which is below their junction. The navigation is generally closed by ice at Sioux City by the 10th of November, and at Fort Leavenworth by the 1st of December. The rainy season of the spring and summer

commences in different years between the 15th of May and the 30th of June (in the latitude of Kansas, Missouri, Iowa, and Southern Nebraska) and lasts about two months. During this period the tributaries of the Missouri in these latitudes maintain this river in good boating stage. The floods produced by the melting snows in the mountains come from the Platte, the Big Shyenne, the Yellowstone, and the Missouri above the Yellowstone, and reach the lower river about the first part of July, and it is mainly on these that the navigator of the Missouri above the Niobrara depends. The length of time the flood lasts is in proportion to the quantity of snow in the mountains, which varies greatly in different years. On the average it may be said to last a month, but a steamer starting from Saint Louis on the first indication there of such rise would not generally reach the Yellowstone before it was nearly past this latter point. Rivers like this, whose navigation depends upon the temporary floods, are greatly inferior for ascending than descending boats. The rise at the Yellowstone would be about ten days reaching Saint Louis, and any good system of telegraphing along the stream, which would apprise those below, would more than double the advantages to the upward navigation. If a miscalculation is made by taking a temporary rise for the main one, the boat has to lay by in the middle part of the river till the main rise comes. From this cause, I, starting on the 16th of April, was thirty-seven days in getting to Fort Pierre, 1,250 miles from Saint Louis. Again, if the boat starts too late, the main rise may all pass the upper river before she reaches it, and her progress will then be slow and tedious. By starting June 6, 1855, (which was too late, it being an early season,) we were forty-one days going to Fort Pierre.

The American Fur Company's boats are of the largest class of freight-boats now navigating the Missouri. They are ably managed, and the company possesses information by expresses sent from its trading posts near the mountains, as to the amount of snow that has fallen and the probable extent and time of the rise produced by its melting. The boats are loaded and time of starting fixed accordingly. Their boats carry from one hundred and fifty to two hundred tons to the Yellowstone, a distance of 1,900 miles, drawing from 3 to 3½ feet of water, and make the passage up in from twenty-two to thirty-five days. Considerable freight is taken out for the post of Fort Union, and they generally ascend with that for Fort Benton to about sixty miles above the mouth of the Yellowstone, and have, on one occasion, gone to Milk River, one hundred miles farther.

The quantity of water is, on the average, about equal from the Yellowstone and Missouri at their junction, and above this point steamboats venture with caution. The great risk, in proceeding farther, of having the boat caught in the upper river during the winter, more than counterbalances the prospective gain. The freight is then taken on board of Mackinac boats and cordeled by hand, aided generally by sails. These boats are from 60 to 70 feet long, drawing 15 to 18 inches, (regulated somewhat by the cordeling force,) though 20 to 24 inches draught could be used. The time from Fort Union to Fort Benton varies from forty to eighty days, depending on various causes, of which wind is the most important. The river distance from Milk River to Fort Benton is about five hundred miles.

The interests of the General Government would be much advanced by making appropriations to remove the snags which obstruct the river below James River.

The Yellowstone.—For the first one hundred miles above the mouth, the bottom lands are nearly all on the left bank; and the first forty

miles are from four to five miles broad, with beautiful, soft, rounded bluffs to the west; the banks of the river are clothed with large cottonwood trees, and the country presents one of the finest locations for a military post and Indian reservation anywhere to be found. After you advance about forty miles up the left bank, the bluffs begin to come on this side almost to the river, and the bottom lands narrow and the timber diminishes. A good route for wagons, however, exists on this side for one hundred miles above the mouth. Having gone thus far you meet with very impracticable bluffs, barely permitting of the passage of pack mules, to get around which with wagons, without crossing the Yellowstone, you must travel out into the prairie one or two days' journey, so as to head the difficult ravines. Bluffs similar to these exist on the right bank all the way from the mouth to this place, but here the river suddenly changes its position in the valley, so as to leave the open valley on the right bank, and causes the difficulty which exists on the other.

This point is also the highest point navigable for steamboats, and those even of very light draught cannot, except at high water, go further than about fifty miles from the mouth, as, in the next space of fifty miles, the channel is so very much divided up by wooded islands and obstructed by gravel-bars. But at the point before mentioned as the head of steamboat navigation, ledges of rock begin in the bed of the stream, and about one-half mile below Powder River we encounter a dangerous rapid, called by Captain Clark "Wolf Rapid." Two miles above Powder River, Captain Clark describes another serious rapid, which he calls "Bear Rapid;" and twenty miles above this another, which he calls "Buffalo Shoal," and which he speaks of as being "the most difficult part of the Yellowstone River." All these rapids are passed every year by the Mackinac boats of the American Fur Company on their way to Fort Alexander Sarpie, and there are probably no obstacles sufficient to prevent them from reaching the point where this river debouches from the mountains.

The valley, all the way to the mountains, is said to be practicable for wagons. Above this point the river is said to be much inclosed by the mountains, which are rugged and difficult, and covered with pine forests.

From Fort Union to Fort Alexander Sarpie, on the Yellowstone, the Mackinac boats are from 50 to 60 feet long, drawing from 15 to 20 inches water, and make the distance, 225 miles, in from fifteen to thirty days.

None of the tributaries of the Yellowstone, (Clark's Fork, Big Horn, Tongue, and Powder rivers,) above their mouths, have ever been visited by any exploring expedition, except those of trappers and hunters.

The Big Horn River is by far the most important of those streams, and has been navigated by the traders in skin boats, carrying their peltries, from the point where it debouches from the Big Horn Mountains to the Yellowstone, a distance of perhaps 150 miles. Above where the stream escapes the mountains, it is not navigable for anything but the smallest boats, and the gorges by which the stream passes the mountain range is impracticable for any kind of land transportation; a considerable detour being required even for pack animals. The portion navigable will, perhaps, according to the opinion of Colonel Robert Campbell, of Saint Louis, furnish a depth of water for Mackinac boats, in high stages, of about 18 inches, but he thinks the navigation of this stream for ascending boats could not be used to any advantage. An undue importance has been given to the navigability of this stream from the erroneous position of the Yellowstone, as laid down on nearly all recent maps, except those from this office, as they make its position

nearly 100 miles too far south. The manner in which I have been able to correct this is given in my report on the compilation of the General Pacific Railroad Map.

Powder River.—This stream rises near the southern point of the Big Horn Mountains, and flows a little east of north. The route from the Platte to the Yellowstone along the stream is practicable, but as a route for wagons it is difficult, requiring the stream to be frequently crossed, and the banks are very muddy, and the bed is occupied in places by quicksand.

The Little Missouri River rises near the North Fork of the Shyenne in longitude 105°. I have seen the country near its source, where it forms the northern part of the upheaved stratified rocks of the Black Hills, and at the mouth where the Lignite Tertiary exists. Its general direction is northeast, and its course through the main portion must be in this Lignite Tertiary formation. From the statements of members of Sir George Gore's party, which traveled up the stream in 1856, I infer that the route along or near its valley is practicable for wagons, though difficult. The valley is one of the great buffalo regions.

The Knife River, *Heart River*, *Cannon Ball River*, *Grand and Moreau rivers*, all rise in the prairie ridge east of the Little Missouri, and they contain but little water in the winter and latter part of summer. I have never seen any of them, except at their mouths, and their lengths on my map indicate their comparative size.

The Big Shyenne is a most important river, and has its extreme sources west of the Black Hills, which its two main branches inclose. These forks are supplied by numerous streams from the mountains, and they unite in about longitude 102° 20′, the river flowing into the Missouri in latitude 44° 48′. In its lower course I am informed there is fertile land on its banks, and there are considerable areas in and around the Black Hills. The Shyenne River can probably be rafted, and the streams that come from the hills could be used to drive the logs down to the river. It must be borne in mind that the pine growing on the Black Hills is difficult of access, and the expense of getting it out may render this fine supply of timber unavailable to the Lower Missouri. The Missouri at the mouth of the Shyenne is in the center of the Dakota country, and along its valley we have the shortest and best route by which to reach their strongholds.

Bad River, *Wakpa Spicha*, (sometimes called Teton River,) receives its name from the unpalatable state of its water in low stages, and the difficulty of traveling along it in wet weather. It lies throughout in the black-shale bed of the Cretaceous formation. It is along the sources of its northern branches that the road from Fort Pierre to Fort Laramie is located.

White River, or White-Earth River, (Mankisita Wakpa, or Smoking-Earth River,) has generally an open, well-wooded valley, with a fine soil and luxuriant grass. The road between Forts Laramie and Pierre follows the valley from its source to the Bad Lands, where the river enters a difficult section bounded with precipices like those on the Niobrara. The Bad Lands extend continuously down the stream to the South Fork, a distance of about seventy miles. Below this, the river winds through a handsome, well-wooded valley of the Missouri. Any one who travels in Nebraska will always feel rejoiced when he reaches the banks of this beautiful stream. It is much resorted to by the Brulés. It has numerous branches, the largest of which is called the South Fork. The pine on White River and its tributaries is nearly equal in extent to that on the Niobrara. This stream has been used by the traders to float

down their peltries by means of skin boats from their former trading-house near Butte Cache. I believe it can also be used to raft down the pine timber on the South Fork.

The Niobrara being a stream heretofore unknown, and one in which the people of Nebraska feel much interest, I shall describe it in detail. This river is about three hundred and fifty miles long. From its source to longitude 103° 15′ it is a beautiful little stream of clear running water, of a width of from ten to fifteen feet, gradually widening as it descends. Its valley furnishes here very good grass, abounding in rushes or prele, but is for the most part destitute of wood even for cooking. After flowing thus far it rapidly widens, till in longitude 102° 30′ it attains a width of sixty to eighty yards; its valley is still quite open and easy to travel along, but destitute of wood, except occasional pines on the distant hills to the north. In longitude 102° 30′ it enters between high, steep banks, which closely confine it, and for a long way it is a complete cañon; here, however, wood becomes more abundant and pine is occasionally seen on the bluffs, while small clusters of cottonwood, elm, and ash occupy the narrow points left by its windings. In longitude 101° 45′ the sand-hills come, on the north side, close to the river, while on the south side they are at the distance of from one to two miles off, leaving a smooth road to travel on along the bluffs. The bluffs gradually appear higher and higher above the stream as it descends until they reach the height of three hundred feet. The sand mostly ceases, on the north side, in longitude 100° 23′; but it lies close to the stream, on the south side, nearly all the way to the Wazi-houska. Throughout this section, lying between longitude 102° 00′ and longitude 99° 20′, a distance of one hundred and eighty miles, the Niobrara is in every respect a peculiar stream, and there is none that I know of that it can be compared with. It flows here between high, rocky banks of soft white and yellowish calcareous and siliceous sandstone, standing often in precipices at the water's edge, its verticality being preserved by a capping of hard grit. It is here impossible to travel any considerable distance along its immediate banks without having frequently to climb the ridges which rise sometimes perpendicularly from the stream. As you approach from the north or south there are no indications of a river till you come within two or three miles of the banks, and then only by the trees whose tops occasionally rise above the ravines in which they grow, so completely is it walled in by the high bluffs which inclose its narrow valley. It seems as if it had resulted from a fissure in the earth's crust, and now flows at a depth of about three hundred feet below the general level of the prairie. The soft rock which forms the bluffs is worn into the most intricate labyrinths by the little streams, all of which have their sources in beautiful gushing springs of clear cold water. In these small, deep valleys the grass is luxuriant; pine, ash, and oak are abundant. To the agriculturist this section has, however, comparatively little attraction, and that between longitude 99° 20′ and the mouth, an extent of about ninety miles, is perhaps far more valuable. Here the bottoms will probably average a width of a quarter of a mile, are susceptible of cultivation, and cottonwood, oak, walnut, and ash will furnish settlements with all the timber and fuel they will need. The river banks seem to present no good building stone, nor did we, though searching diligently, discover any signs of coal or other valuable minerals.

In describing the tributaries to the Niobrara, I shall begin at the mouth and take the north side first. The Ponka River, which has a very fine, well-wooded, and fertile valley, runs into the Missouri about five miles north of the Niobrara, in latitude 42° 48′ north. Its course

is parallel and near to that of the Niobrara as far up as the mouth of Turtle Hill River.

Turtle Hill River (Keya Paha Wakpa) is the main branch of the Niobrara, and is about one hundred and twenty miles long. Prior to the publication of my report and map of reconnaissances in 1855, this branch was represented erroneously as being equal to the main river, in size, above their junction.

I crossed it in 1855, sixty miles below its mouth, and it has a very fine valley, one-half to three-quarters of a mile wide, with good soil and a limited quantity of cottonwood timber. The bed of the stream is sandy, and its waters are clear and sweet; width at the mouth fifty yards. The first twenty miles of the space between this branch and the main river is occupied by sand-hills.

The next northern branch which joins the Niobrara, in longitude 100° 23′, is named Mini-cha-duza-Wakpa, or Rapid Creek. At its mouth it is about eight yards wide, with a valley about a quarter to half a mile wide, and a soil quite fertile; the banks are scantily fringed with small trees. It forms about the eastern border of the sand-hills on the north side of the Niobrara, as far as we could see. Its length is about fifty miles.

There are numerous ravines with steep rocky banks, containing springs and running streams, extending out from five to seven miles between this branch and the Keya Paha, at the heads of which occasionally good camping-places may be found.

The mouth of the next stream is in longitude 101° 18′; it has scarcely any appreciable valley, and flows between high rocky bluffs difficult to ascend and descend; it is about five yards wide, with clear, deep, swift-running water, and is probably about 35 miles long.

The mouth of the next northern tributary is in longitude 101° 30′, and is called White-Earth Creek; it is about three-fourths the size of Rapid Creek, which it resembles in every particular, and is about 25 miles long. The next, in longitude 102°, is a small spring rivulet about 26 miles long, and above this the branches are all small runs coming from the bluffs, generally dry except after rains, with scarcely any valleys to speak of.

On the south side of the Niobrara there are numerous small branches coming in between its junction with the Missouri and the point where it receives the waters of the Turtle Hill River. Three of these are of considerable size, probably 35 miles long, the bluffs along nearly all of them being more or less covered with scattered pine, and their valleys occupied with clumps of cottonwood, oak, ash, &c. The position of the Elk Horn River, about 30 miles south of the Niobrara, prevents any of these southern branches having a length greater than I have stated. From the mouth of Turtle Hill River to that of the Wazi-honska there are still a greater number of short southern branches, all containing springs of water, and abounding in pine and beautiful oak groves.

Wazi-honska means, in the Dakota language, "the place where the pine extends far out;" and this stream, whose mouth is in longitude 100°, is probably 40 miles long, and all its bluffs and side ravines are green with pine. Its valley, though not so wide, is very similar to that of the Niobrara in this part, which has been described.

Snake River, whose mouth is in longitude 100° 45′, is quite a large stream, some thirty yards wide, its bluffs covered with pine, with a narrow valley like the Wazi-honska.

Above this there is scarcely any branch coming in from the south deserving mention.

Niobrara is a very shallow and "swift-flowing stream," as the Canadians say "l'Eau qui Court," abounding in rapids in two-thirds of its upper course, and in its middle portion filled with small islands. In the lower portion its width exceeds that of the Missouri River, and is spread out over sand-bars. The bed in the broad portions is quicksand and difficult to ford. Its waters rapidly increase in volume through its middle portion, from the multitude of springs and streamlets that constantly flow into it from the foot of the bluffs and out of the ravines.

The traders of the American Fur Company have navigated it with skin boats, carrying peltries from their former trading-house near Snake River, and the stream might permit of rafting if the timber should be found of quality, and quantity, and accessibility to defray the expenses. I cannot, however, look upon it as capable of furnishing timber for the country on the Missouri, for the reason that much of the pine is too small, crooked, and knotty, and grows in places difficult to transport it from. The species is what is called the Rocky Mountain pine, has a yellowish-white appearance, and abounds in resin. The distance on the Niobrara over which these pine ravines extend is about 120 miles.

A road could not be made on the bottom lands of the Niobrara; it must keep out on the high prairie so as to head the ravines. From the mouth to Turtle Hill River it would take the narrow divide between the Niobrara and Ponka Rivers. It should remain on the north side of Turtle Hill River from 20 to 30 miles farther, and then cross that stream, as it would thus avoid the sand at the junction of the Niobrara and Turtle-Hill rivers, and cross the latter where there is a better ford or narrower stream to bridge. Turning then toward the Niobrara, this river must be crossed in longitude 101° 20′ to avoid the sand-hills, and the route must continue on the south side to about longitude 102°, when it should again cross to the north side. These crossings for a wagon-road could easily be made at a ford or by bridging, but a proper bridge for a railroad-crossing at these places would be a stupendous undertaking; for, on account of the nature of the banks and ravines, good approaches could not be found so as to descend to the level of the stream, and the bridge would have to be built very high. From longitude 102° west there are no difficulties, beyond a scarcity of wood, in reaching Fort Laramie, or continuing direct to the South Pass, and in this course abundance of excellent pine would be found near Raw Hide Peak.

A preferable road might be found by continuing up Turtle Hill River to its source, and then along the divide between Niobrara and White Rivers, striking the former stream in longitude 102°; but these divides are generally bad for wagon-routes, on account of scarcity of water, and it is not certain that we would by that route avoid the sand-hills.

I consider the north side of the Niobrara superior to the other for a road for the first 90 miles above the mouth, as the greater number of streams coming in at the south side would occasion considerable detours in gaining good crossing-places and approaches. The portion of the river flowing through the sand-hill region has the sand on the south side generally for one-half a mile, blown away by the wind, leaving a smooth route. On the north side these hills are crowning the very edges of the precipices that rise from the river, and cannot be avoided. The evidence that this difference between the two sides was due to the wind is very complete, and shows that the prevailing winds blow much more from the north here than from the south.

The Elk Horn River rises in about longitude 99°, about 25 miles south of the Niobrara River. Its general course is southeast, and it empties

into the Platte. As far up as I have seen it, which is in latitude 42°, it has a broad, fertile, and well-wooded valley. Where crossed by Lieutenant Smith in 1855, nearly south from Fort Randall, it is described by him as "a beautiful creek of clear water, with well-timbered banks and firm sandy bottom."

The valley of the Loup Fork is broad, fertile, and well wooded up as far as the old Pawnee villages, a distance of about 80 miles. Above this the valley begins to grow sandy and wood more scarce, and about the meridian of 100° becomes worthless. An occasional farm-site could, however, be found almost to its head. Near its source it flows through high rocky precipices similar to those on the Niobrara; but its source is in the open and desolate sand-hills, a miserable region, impassable for ordinary wagon-trains, and by all means to be avoided. The same remark is true of its main north branch and of Calamus River, and probably of the south branch.

The Platte River is the most important tributary of the Missouri in the region under consideration, and its broad and grass-covered valley, leading to the west, furnishes one of the best wagon-roads of its length in America. From its mouth to the forks, the bluffs are from two to five miles from the water, making an intermediate bottom-valley of from four to eight miles wide. From the forks to Fort Laramie the bluffs occasionally come down to the water's edge, and the road has to cross the points of the ridges. From Ash Hollow to Fort Laramie the road is sometimes heavy with sand. Fine cottonwood grows along the banks and on the islands, from the mouth to Fort Kearney; from here up it is scarce and of small size. Cedar is found in the ravines of the bluffs in the neighborhood of the forks and above. The river is about a mile wide and flows over a sandy bottom. When the banks are full it is about six feet deep throughout, having a remarkably level bed; but it is of no use for navigation, as the bed is so broad that the water seldom attains sufficient depth, and then the rise is of short duration.

The streams of the prairies of Nebraska below the Yellowstone, flowing into the Missouri River, are none of them navigable to any reliable extent; and as most of them run from west to east, their greatest practical value is in affording the land route of communication between our present western settlements and those to be formed in the mountains. Their valleys furnish us the only routes by which to traverse the intervening desert, for here only are such supplies of water to be found as are required, and here, too, is the only soil that can be cultivated, and such scanty supplies of wood as the region produces.

Of all the valleys of rivers running into the Missouri, that of the Platte furnishes the best route for any kind of a road leading to the interior, and the best point of starting is the vicinity of Omaha City. An appropriation of $50,000 has been expended on bridges, &c., on the eastern portion of it, and the only important improvement remaining to make it far superior to any route on the south side of the Platte is the establishment of a good crossing of Loup Fork, either by bridge or ferry, both of which are difficult: the first on account of the width of the stream—1,000 yards; and the latter on account of the shoals and shifting sand-bars. The ford is bad, by reason of quicksands. Twenty-five thousand dollars would probably make a good crossing to this stream, as the place is within the limit of the settlements. No road improvement in the West would be of greater value to the emigrant or to military operations; and this once done the route would not only be the shortest one in this latitude from the Missouri to the mountains, but would not throughout have one serious obstacle all the

way to the South Pass. Any route that takes the south side of the Platte River has the South Fork to cross, (which is about as difficult a stream as the Loup Fork,) at a point where bridging it or establishing a ferry is, at this time, impracticable; the road then, along the North Fork, has bad places at Ash Hollow and Scott's Bluffs, and has to cross the Laramie River and the North Fork of the Platte by bridges, over which the emigrant must pay toll. The route by the north side of the Platte crossing the Loup Fork is, therefore, of particular value, especially for early travel in the spring, when the streams are generally high.

I have spoken of the locality of Omaha being, in my opinion, superior to any other as a point from which to supply the interior portions of the country along the Platte. This in a measure depends upon the improvements being made of the crossing of Loup Fork. At present Nebraska City is a point presenting almost as short a road, which could be made quite so if bridges were placed over a few small streams, and which could be done at an expense to the General Government of not more than $20,000. A considerable distance of river transportation would also be saved to stores brought from Saint Louis by selecting Nebraska City instead of Omaha. Besides, the first mentioned must always be a superior point from which to supply Fort Kearney. The cost of river transportation to this point is about 75 cents per 100 pounds. The distance from Nebraska City to Fort Laramie, by the proposed improved route, is about five hundred and twenty-five miles. From Fort Leavenworth to Fort Laramie it is about six hundred and forty-five miles.

The price paid for transportation, by the Quartermaster's Department, on these roads, is about $1.50 per 100 pounds per hundred miles.

It will thus be seen that the transportation of stores to Fort Laramie, by the route from Nebraska City, would be a saving over that from Fort Leavenworth of about $1.55 per 100 pounds. The total expense from Saint Louis via Nebraska City would thus be $8.62½ per 100 pounds, and I shall use this route in making a comparison of the advantages offered by any route to the north of it.

The first place which apparently offers a superior route is the neighborhood of Fort Randall. Stores can be delivered at this point from Saint Louis at a cost of about $2.25 per 100 pounds. The distance to Fort Laramie is about three hundred and eighty miles, which, at the rate of $1.50 per 100 pounds per hundred miles, would give a total cost of about $7.95 per 100 pounds, which would apparently indicate a saving over the Nebraska City route of $0.67 per 100 pounds. There are two reasons, however, why this advantage is practically not now attainable: first, the neighborhood of Fort Randall, as a depot for supplies, men, and animals, is not to be compared with Nebraska City, the former being in a comparatively barren country destitute of inhabitants, and where the necessary store-houses can only be constructed at an expense not less than $100,000; second, the great difficulties of the route from Fort Randall west. That it is practicable to take wagons along the Niobrara is shown by our expedition in 1857. The wagons were loaded with about 2,000 pounds, and drawn by eight good mules to each.

Our time of traveling from Fort Laramie to Fort Randall, counting the days necessary to stop to rest the animals, was thirty days. About one hundred miles of this route was through sand-hills, where I do not think the ordinary transportation trains could have traveled except in the slowest and most fatiguing manner.

The route I have already indicated on the south side of the Niobrara, in my description of that stream, would be preferable to the one we

traveled, on account of the sand, but the difficulty of crossing the river would counterbalance the advantage gained by so doing.

The route between Sioux City and Fort Randall is a very good one, and an appropriation of $10,000 should be made to bridge the Vermilion, for the use of the troops at the fort in hauling supplies from the settlements in Iowa.

This route, and that by the Niobrara, would seem to be the most direct and proper one by which to continue the military road from Mendota to the mouth of the Big Sioux, westward to the South Pass. But the great difficulties of the Niobrara route, and the impracticability of any between it and the Platte, determine me to advise its location direct from Sioux City to the mouth of the Loup Fork.

The road this way, and thence along the Platte Valley, will only be about forty miles longer than by way of the Niobrara. A bridge is required over Middle Creek, at a cost of $5,000; one over the Elk Horn, at a cost of $20,000; and one over the Loup Fork, at a cost of $50,000. A good crossing for the Loup Fork could be made for $25,000.

The next point on the Missouri which claims attention, as one from which to supply Fort Laramie, is the vicinity of old Fort Lookout. A route from this point should keep north of the White River, and intersect the present road from Pierre to Laramie. The eastern portion of the route I have only examined in part, but feel confident that it is a good one, except for about thirty miles through the Bad Lands, in which I have no doubt a route could be found that, with some improvement, would be equal to the corresponding part of the Pierre and Laramie route.

The route west of this would then be the excellent one along the valley of White River, at the head of which a difficult section of about twelve miles needs considerable improvement. This route would be about three hundred and sixty miles from the Missouri to Fort Laramie, and deserves especial consideration as being the proper continuation of the route located between the Missouri and Fort Ripley under the Interior Department, with the design of being continued to the South Pass. Stores can be delivered at Fort Lookout for about $3 per hundred pounds.

The route from Fort Pierre to Fort Laramie is one that has long been in use, and is about three hundred and twenty-three miles long. Stores can be delivered here for about $3.50 per hundred pounds. I think it probable, as settlements advance up the Missouri, and Nebraska and Iowa and Dakota become populated, this route, or the one starting from Fort Lookout, will claim attention.

At Fort Pierre the navigable portion of the Missouri is at its nearest point to Laramie and the South Pass, and above it, of course, there are no competing routes for supplying this section. Neither does the nearest navigable point for steamboats on the Yellowstone or its tributaries offer any route whose diminished length would compensate for the increased river transportation. It is believed that any route which keeps east of the Big Horn Mountains is practicable for wagons between the Yellowstone and Missouri, and that the direct route between Fort Laramie and Fort Benton is favorable to military movements.

In consideration of the best routes for supplying the interior, I have mainly had in view the wants of present occupation of the country. When the habitable portions of Nebraska become occupied, as they eventually will, other routes will become important from causes not now operating and that cannot be foreseen; but I believe that those which are now most important will still maintain the ascendency from the

effect of natural causes and the structure of the country. The same routes now most used and best adapted to the wants of military occupation were long before used by the trader, the Indian, and the buffalo, as best adapted to their wants; and when future requirements shall demand increased facilities of transportation and locomotion, and railroads shall be built, then they, too, will be found near the main routes now traveled by the trains of the emigrant and the army.

As I before stated, an irreclaimable desert of two hundred to four hundred miles in width separates the points capable of settlement in the east from those on the mountains in the west. Without doubt these mountain regions will yet be inhabited by civilized men, and the communication with the east will require railroads, independent of the want of an interior overland route to the Pacific. For this purpose the valley of the Platte offers a route not surpassed for natural gradients by any in the world, and very little more is to be done west of the Missouri than to make the superstructure. A cheap road for light trains and engines could easily be built, and when settlements are formed in the mountains will become profitable; and the gold that has been discovered there in valuable quantities may produce this result much sooner than we anticipate. The Niobrara apparently presents a more short and direct route to the interior than the Platte, but its natural features are not so favorable. The direct route from Sioux City to Fort Laramie by the Niobrara would be, for a railroad, about forty miles shorter than by way of the Platte and Fort Kearney.

I do not, however, consider the route by the Niobrara as impracticable, but think that the difficulties in the way of constructing it will overbalance the advantages of being a shorter route from the Missouri. If the route be considered as starting at the city of Chicago, thence via Rock Island, Omaha, and the Platte Valley, the distance is about the same as that by Dubuque, Sioux City, and the Niobrara; the one large bend which the former makes at Fort Kearney being counterbalanced by the number of small ones of the latter.

A route for a railroad to the Pacific from the neighborhood of Saint Paul, by way of the South Pass, would keep on or near the general course of the wagon-road lately laid out by Colonel Nobles to the Missouri, at Fort Lookout, and thence along the north side of White River, as before indicated.

Should a route ever be required from the west shore of Lake Superior to the South Pass, it could be located on a very direct and practicable line, via Fort Ripley, Lake Traverse, and the Big Shyenne, and deserves examination.

But a route from Lake Superior west to the South Pass would probably not compete in advantages with that examined by Governor Stevens near the 49th parallel. It may, however, be questionable whether one of equally as many advantages could not be found by proceeding directly west from the Bois de Sioux to the Missouri at Fort Clark; thence by way of Knife River to the Yellowstone River at the mouth of Powder River. The valley of the Yellowstone then offers a direct route west to the mountains, where Captain Clark crossed them in 1806, and thence near the route he pursued to the Bitter Root Valley. The more direct route would be down the valley of the Salmon River; but the information we possess of this stream indicates its character through the mountains to be one of great difficulty.

CHAPTER V.

INDIANS—MILITARY POSTS—ROUTES FOR MILITARY OPERATIONS, ETC.

I shall here repeat, with some additions, the account of the Dakotas given in my report of explorations in 1855.* The Dakotas are scattered over an immense territory, extending from the Mississippi on the east to the Black Hills on the west, and from the forks of the Platte on the south to Devil's Lake on the north. They say their name means "leagued" or "allied," and they sometimes speak of themselves as the "Ocheti Shaowni," or "Seven Council Fires." These are the seven principal bands which compose the nation, viz:

1. The Mde-wakan-tonwans, meaning "Village of the Spirit Lake."
2. Wah-pe-kutes, meaning "Leaf-Shooters."
3. Wah-pe-tonwans, meaning "Village in the Leaves."
4. Sisi-tonwans, meaning "Village of the Marsh."

These four constitute the Mississippi and Minnesota Dakotas, and are called by those on the Missouri "Isanties." They are estimated at 6,200 souls. Some of these on the Mississippi have long been in contact with the white settlements, and having sold much of their lands to the Government, have abandoned many of their former habits and cultivated the soil. Communities have been formed which have made some approach toward civilization; others of them still live principally by the fruits of the chase in their primitive wildness, and have of late years occasioned much trouble to the settlers of Northern Iowa. It was they who committed the murders last winter on Spirit Lake.

5. Ihanktonwans, (Yanktons,) "Village at the End." These are sometimes called Wichiyela, meaning "First Nation." They are found at the mouth of the Big Sioux and between it and the Missouri River, as high up as Fort Lookout, and on the opposite bank of the Missouri. They are supposed to number 360 lodges. Contact with the whites has considerably degenerated them, and their distance from the present buffalo ranges renders them comparatively poor. A treaty has been made with them, by which they have ceded most of their land to the United States.

6. Ihanktonwannas, (Yanktonnas,) meaning one of the "End Village" bands. They range between James River and the Missouri, as high north as Devil's Lake, number about 800 lodges, and are spirited and warlike, and will give much trouble to the settlers in Dakota Territory. They suffered severely from the ravages of the small-pox in the winter of 1856 and 1857. A small portion, under a chief called Little Soldier, live in dirt lodges during the summer. From the Wazikute branch of this band the Assinniboins, or Hohe of the Dakotas, are said to have sprung.

7. The Titonwans, "Village of the Prairie," are supposed to constitute more than one-half of the whole Dakota Nation. They live on the western side of the Missouri, and extend west to the dividing ridge between the Little Missouri and Powder Rivers, and thence south on a line near the 106th meridian. They are allied by marriage with the Shyennes, but are enemies of the Pawnees and Crows. The Titonwans, except a

*I am largely indebted for the following description to the "Dakota Grammar and Dictionary," one of the volumes of the Smithsonian Contributions to Knowledge, published in June, 1852, by the Smithsonian Institution, Professor Joseph Henry, Secretary. It was edited by Rev. S. R. Riggs, A. M., missionary for the American Board of Foreign Missions, under the patronage of the Historical Society of Minnesota. Also to the letter of G. A. Belcourt, missionary priest, published with the report of Bvt. Maj. Samuel Wood, Sixth United States Infantry, in 1850.—(See H. Ex. Doc. No. 51, 31st Cong., 1st sess.)

few of the Brulés, on White River, and some of the families connected with the whites by marriage, have never planted corn. They are divided into seven principal bands, viz :

1. Unkpapas, "they who camp by themselves." They roam from the Big Shyenne up to the Yellowstone, and west to the Black Hills; to this band Mato Chiqukesa, or the Bear's Rib, belongs, who was made by General Harney the first chief of the Dakotas. They number about 365 lodges.

2. Sihasapas, (Blackfeet.) Haunts and homes same as the Unkpapas They number 165 lodges. These two bands have very little respect for the power of the whites.

3. Itazipchos, (Sans Arc, "no bows.") Roam over nearly the same territory as the Unkpapas. They number about 170 lodges. It is difficult to say how these bands received their present names; the Itazipchos being as well provided with bows as any other band, and use them as skillfully.

4. Minikanyes or Minni-kan-jous, (meaning "they who plant by the water.") They number about 200 lodges, and roam principally from the Black Hills south to the Platte. They are generally well disposed toward the whites.

5. Ogalalas or Okandandas. They number about 460 lodges, and are generally to be found on or near the Platte near Fort Laramie. They are the most friendly disposed toward the whites of all the Titonwans.

6. Sichangus, (meaning Burnt Thighs,) Brulés. They number about 380 lodges, and live on the Niobrara and White Rivers, and range from the Platte to the Shyenne. They include the Wazazhas, to which belonged Matoiya, (the Scattering Bear,) made chief of all the Dakotas by Colonel Mitchell of the Indian Bureau, and who was killed by Lieutenant Grattan.

7. Oo-he-non-pas, (Two Boilings, or Two Kettle band.) These are now very much scattered among other bands. They number about 100 lodges. Some of them are generally to be found in the neighborhood of Fort Pierre.

The Dakotas, on and west of the Missouri, which includes all but the Isanties, are the only ones I have heard estimated. I should think eight inmates to a lodge, and one-fifth of them warriors, an ample allowance. We would then have—

Name of band.	Lodges.	Inmates.	Warriors.
Ihanktonwans, (Yanktons)	360	2,880	576
Ihanktonwannas, (Yanktonais)	800	6,400	1,280
Unkpapas	365	2,920	584
Sihasapas, (Blackfeet)	165	1,320	264
Itazipchos, (Sans Arc)	170	1,360	272
Mini-kan-jous	200	1,600	320
Ogallalas	460	3,680	736
Sichangus, (Brulés)	380	3,040	616
Oo-he-non-pas, (Two Kettles)	100	800	160
	3,000	24,000	4,800

In the summer the Dakotas follow the buffaloes in their range over the prairie, and in the winter fix their lodges in the clusters or fringes of wood along the banks of the lakes and streams. The bark of the cottonwood furnishes food for their horses during the winter snows, and

to obtain it many streams have been thinned or entirely stripped of their former beautiful groves. Their horses are obtained by traffic with the Indians farther south, who have stolen them in New Mexico, or caught them wild on the plains toward the Rocky Mountains; considerable numbers are also raised by themselves. The nation is one of the most skillful and warlike, and most numerous in our territory, and could they be made to feel more confidence in their own powers, would be most formidable warriors. In single combat on horseback they have no superiors, a skill acquired by constant practice with their bows and arrows and lances, with which they succeed in killing their game at full speed. The rapidity with which they shoot their arrows, and the accuracy of their aim, rivals that of a practiced hand with the revolver. Notwithstanding the destruction of their numbers by small-pox and cholera, it is the opinion of some that they are increasing in numbers rather than diminishing, except where they mingle with the settlements on the frontier.

These Dakotas formerly all lived around the headwaters of the Mississippi and Red River of the North, and in their migration to the southwest have been preceded by the Shyennes, (with whom they are on friendly terms,) who have given their name to the Shyenne of Red River, to the Big Shyenne of the Missouri, and to the section of country they now occupy between the Platte and the Arkansas. The Dakotas then lived on much of the land now occupied by the Chippewas, and the Chippewas at that time inhabited the region between the Sault Ste. Marie and Lake Winnepeg, the Crees, their allies, occupying that from Lake Winnepeg and other lakes as far as Kis-is-kad-ji-wan (Saskatchawin River) and toward the Assiniboin River. The plains to the south of the last stream were the scene of many contentions and bloody combats, nevertheless, oftener the residence of the Dakotas than of the other two tribes, until that nation was divided into two bodies, originating in jealousy of the women, which ended in their being irreconcilable enemies to this day. The less powerful and flying party took refuge in the rocky precipices of the Lake of the Woods, and received from the Chippewas the name of Assiniboins, or Dakotas of the Rocks, under which name they are now generally known to the whites. They, however, retain among themselves the name Dakotas, and speak that language. The other Dakotas, in speaking of them, always call them *hohé*, or enemies.

The Assiniboins then allied themselves with the Chippewas and Crees and forced the Dakotas to abandon all the country north of the Shyenne, which is now regarded as the boundary between these tribes.

The Chippewas, Crees, and Assiniboins are friendly to each other and united in their hostility to the Dakotas, and it is improbable that any lasting peace can ever be effected between them. The common war ground is the region about Lake Minniwaken, to which they all repair to hunt buffalo. The Assiniboins and Crees may yet occasion us no little difficulty, as a large portion of their lands is in the British territory. They both are now well disposed and friendly. I saw them while at Fort Union in 1856, and they were particular to inform us that they did not want to sell their land, and could not spare any of what they now occupy.

These Indians have comparatively few horses, and rely largely on dogs, of which they have great numbers, for transportation. The flesh of these animals also serves them as food. The Assiniboins number about 450 lodges, or 3,600 souls. They suffered severely from the small-

pox in 1856–'57. Their country extends from the Red River west along the Missouri as far as the mouth of the Milk River.

The Absarakos or Crows occupy the country about the Yellowstone and its branches, being bounded on the east by the Dakotas, south by the Platte, and west by the dividing line between the waters of the Atlantic and Pacific.

Their country abounds with everything Indian life requires, and they are generally well disposed toward the whites, but have as yet seen little of them in their country since 1830, when the trappers were so numerous. They were then much dreaded by these adventurers. The Crows are fine warriors; have plenty of horses, mainly derived from traffic with the Flatheads. They live generally in skin lodges, and number about 600 lodges, or 4,800 souls.

Minnetarres, or Gros Ventres. This is a small band of the Crow Nation, living in a village of dirt lodges, surrounded by a rude stockade, near Fort Berthold. They raise corn, beans, pumpkins, &c. They number now about 800 souls, but, from a variety of causes, are diminishing.

The Arricarees, or Rees, are a branch of the Pawnee Nation, from which they have become separated by the migration of the Dakotas, and by these latter they are both known by the same name—Pedanis.

The Rees live in a village near Fort Clark, in a manner exactly similar to the Gros Ventres, and number about 840 souls. Formerly they were numerous and powerful and occupied a large village at the mouth of Grand River. This was destroyed during the expedition under Colonel Leavenworth, sent there in 1825 or 1826 to chastise them for the attack on the trading party of General Ashley. The remains of dirt-lodge villages all along the Missouri attest how numerous the Indians of this tribe must have been before the invasion of their lands by the Dakotas.

The Mandans live in a village, six miles above Fort Clark, in the same manner as the Gros Ventres. They seem to be the last remnant of a distinct tribe from any of those around them. They have, through the agency of the small-pox, rapidly diminished since they were visited by Lewis and Clark, and now number about 250 souls. They live in constant dread of the diseases which white men have been at times introducing among them, and the main and oft-repeated request which they made to the Indian agent when I was there in July, 1856, was that he would keep sick white men away. When I returned there in September, and saw them again a victim of that scourge, the small-pox, brought among them that year by the steamboat of the rival company to the American Fur Company, and saw the despair depicted on every countenance, it made me feel heart-sick to think what wrongs these poor savages have suffered from the cupidity of my own race. The authors of this calamity, which visited all the tribes in this region, are fully exposed in the report of the Indian agent, Colonel Vaughan, in 1856–'57.

Bear's Rib, the Unkpapa, gave me the following list of persons that died of this disease, from this cause, in 1856 and 1857, that he had heard of, though the disease was still at its work of death in some parts of the Crow country:

	Persons.
Rees	166
Hohés	1,500
Big Head's band of Ihantonwans	30
Sihasapas	136
	1,832

It would be safe to assume the following as probable deaths in tribes not included in this list:

Gros Ventres and Mandans	160
Absarakos	1,000
	1,160

Making a total of at least 3,000 souls.

Before such blows as this the red race would soon disappear; no war could be so fatal to them. The Government should, by all that is humane, employ some competent person, at a proper salary, to visit them yearly and vaccinate these Indians, and thus arrest the violence of these scourges.

These three little bands, the Gros Ventres, Mandans, and Rees, are fast dwindling away. They never can work much harm to the whites, and their mode of life at a fixed abode requires them to be peaceful. They exist now rather by sufferance of the Dakotas than by their own power, for the Dakotas could soon destroy them if they chose, as they did the villages of the Pawnees, on the Loup Fork, in about the year 1836. The Dakotas find it convenient for themselves to permit the existence of these villages, as their produce of corn, &c., forms a valuable commodity of trade between them.

The Ponkas are the small remnant of a once powerful tribe, and now live near the mouth of the Niobrara. They are on friendly terms with the Dakotas. The Government agents have lately effected a treaty with them by which a right to most of their lands has been purchased, and a reserve marked out for their location on the Niobrara and Ponka Rivers, near Fort Randall. The treaty has, I believe, not yet been ratified by the Senate. They number about ——— souls.

The Pawnees were formerly one of the most numerous and powerful and warlike of the Indians of the prairie. They have, through the agency of the small-pox and their constant wars with the Dakotas and Shyennes, been greatly reduced, and their numbers now do not probably exceed 4,000. They occupy the country on the Platte below Fort Kearney, and on Loup Fork. A treaty was made with them in the winter of 1857, by which they ceded a large portion of their lands to the United States, and agreed to retire to a reserve on the Loup Fork, where were their villages which were destroyed by the Dakotas. This treaty has not yet been ratified.

The Shyennes occupy the country between the Platte and Arkansas rivers, and number about —— souls. These Indians have always been friends with the Dakotas, and associate much with them. During the summer of 1857, while the vigorous expedition conducted by Colonel Sumner was operating against them, a number to the amount of 40 lodges took refuge among the Dakotas, in the neighborhood of the Black Hills.

They will probably unite with the Dakotas in the event of any general war; though it is believed, from the great moral effect produced by the march of the Utah expedition through their common country, that they must see the futility of ever being able to contend against the power of the United States.

Of all the aborigines in the Territory under consideration, the Dakotas are probably the ones that have undergone the least material diminution of their numbers since their discovery by the whites. They are still numerous, independent, warlike, and powerful, and contain within them-

selves means of prolonged and able resistance to further encroachments of the western settlers. Under the present policy of Government, which there is no reason to believe will ever be changed, these encroachments will continue and new wars will result. I do not mean to say that a peaceable advance of the settlements westward might not be effected, but under the operation of present causes it will not. All of these conflicts end in the discomfiture of the native races, and they are fast melting away. It is not, as many suppose, that those dispossessed retire farther west; this they cannot do, for the region to the west of one tribe is generally occupied by another with whom deadly animosity exists. Hence, when the white settlements advance their frontier, the natives linger about till disease, poverty, and vicious indulgence consign them to oblivion. The present policy of the Government seems, therefore, the best calculated that could be devised for exterminating the Indian.

The advance of the settlements is universally acknowledged to be a necessity of our national development, and is justifiable in displacing the native races on that ground alone. But the Government, instead of being so constituted as to prepare the way for settlements by wise and just treaties of purchase from the present owners, and proper protection and support for the indigent race so dispossessed, is sometimes behind its obligations in these respects; and in some instances Congress refuses or delays to ratify the treaties made by the duly-authorized agents of the Government. The result is, that the settler and pioneer are precipitated into the Indian's country, without the Indian having received the just consideration promised him; and he often, in a manner that enlists the sympathies of all mankind, takes up the tomahawk in defense of his rights, and perishes in the attempt.

It is frequently the case that the settlers are unjustly charged with bringing about these wars, and, though I feel for the Indian, I cannot but sympathize with the pioneer, whose life is liable to be sacrificed to the Indian's vengeance.

The western settlers are now fighting the battle of civilization exactly as our forefathers did on the Atlantic shores, and under circumstances that command an equal amount of our admiration and approval.

We are in the habit of looking on the power of the United States as invincible, but it is far from being so regarded by the savages on our frontier. Many of them have never seen or felt it. There the Indians far outnumber the whites, and, if our sympathies must go with the weak, they should be with the settlers, who are only able, after all, to maintain their ground by the aid of the Army.

One of the chiefs of the Dakotas told me that they had a grand council in the summer of 1857, on the North Fork of the Shyenne, and that their hearts felt strong at seeing how numerous they were; that if they went to war again they would not yield so easy as they did before. At that council they solemnly pledged to each other not to permit further encroachments from the whites, and he fully believed they were able to whip all the white men in the world. In truth, they are not without reason in thinking so. They have never seen the whites except in small parties, stealing through their country, unable to resist them or protect themselves from insolence; or they find them shut up in little trading-posts, where for days they dare not, at times, open the gates or show their heads above the inclosure, and where, whenever a band of young warriors wish to have a frolic, they go and shoot their dogs, chickens, cattle, &c., break the windows, and commit any other outrage their fancy may suggest, as a diversion. They have seen the Indian agent, (their father, as he is called,) the direct representative of the President,

insulted and abused with impunity by their own race, and sometimes in dread of losing his life, and they, many of them, entertain no respect for the power of our Government. Numbers of them have never seen a soldier of the United States Army, and scarce credit their existence.

Bear's Rib (a great friend to peace with the whites and the most influential warrior in his nation) said his people could not be controlled by him, and that if he should attempt it in some cases his own life would be the forfeit.

There are so many inevitable causes at work to produce a war with the Dakotas before many years, that I regard the greatest fruit of the explorations I have conducted to be the knowledge of the proper routes by which to invade their country and conquer them. The Black Hills is the great point in their territory at which to strike all the Teton Dakotas, except the Brulés and Okandandas. Here they can assemble their largest force, and here I believe they would make a stand. In the event of another outbreak, a post should be established at the mouth of the Shyenne, on the north side, from which to operate simultaneously with troops from Fort Laramie. From both of these points wagon-trains could move with ease, and supplies could without difficulty be sent thus to the troops in the field. These operations would undoubtedly bring on a battle, where the superiority of the weapons of civilized warfare would secure a victory to us. They will not, I think, permit the occupation of the vicinity of these hills without offering a determined resistance. Driven from these they must go north towards the Missouri, where a still better field to operate against them will be found, as this region is everywhere practicable. In this event it might become necessary to establish a temporary post above the Shyenne, and a most suitable and effective location is to be found near Long Lake, on the Missouri.

Those who may take refuge in the ravines and fastnesses along the Niobrara, or in the sand-hills, should be operated against from Forts Randall, Kearney, and Laramie. Should the Isanties and Ihanktonwannos be hostile at the same time as the Titonwans, they should be operated against from Fort Ridgeley.

It will be perceived that in this plan I have considered a war with all the Dakotas to be on our hands, which at no distant day is probable, and that there will be required a number of columns and a very large force to successfully operate over so much country. These columns need not exceed in any case a strength of 400 men, and these should be subdivided so as to beat up the country as much as possible, and endeavor to draw the Indians into an engagement where they may have some hope of success. With proper troops and commanders we need not even then fear the result.

The movement of large compact columns is necessarily slow, and they can easily be avoided, which the least military skill teaches the Indians to do. The war once begun should not be stopped till they are effectually humbled and made to feel the full power and force of the Government, which is a thing in which the Northern Dakotas are entirely wanting.

I believe a vigorous course of action would be quite as humane as any other, and much more economical and effectual in the end. With proper arrangements the Assiniboins and Crows and Pawnees could be made most useful allies in a war with the Dakotas. I see no reason why they should not be employed against each other, and thus spare the lives of the whites.

In giving my opinion of the best way of bringing the Dakotas to sub-

mission, in the event of a war, I think it my duty to state that I believe many of the causes of war with them might be removed by timely action in relation to the treaties, which are from time to time made with them, and a prompt and faithful fulfillment of our own part of the stipulations, and it is to be hoped that Congress will afford the means of carrying into effect the treaty made by General Harney in 1856, and those made by the Indian Bureau in 1857 with the Ihanktonwans and Poncas, and that it will provide liberally for those who have been dispossessed of their lands or impoverished by having their game driven off by the approach of the whites.

I have always found the Dakotas exceedingly reasonable beings, with a very proper appreciation of what are their own rights. What they yield to the whites they expect to be paid for, and I never have heard a prominent man of their nation express an opinion in regard to what was due them in which I do not concur. Many of them view the extinction of their race as an inevitable result of the operation of present causes, and do so with all the feelings of despair with which we should contemplate the extinction of our nationality.

MEDICAL REPORT.

By Dr. Samuel H. Moffitt.

Washington, D. C., *January* 31, 1858.

Sir: I submit a report of the most important cases of sickness that required medical treatment in the party under your command, from June 15 until December 4, 1857.

After the party reached the Loup Fork it was necessary to remain in camp for a number of days awaiting the arrival of the escort. The mouth of that stream was reached July 4, and we encamped near the river not far from the town of Columbus. It was in this locality that the most serious cases of illness which occurred in the party were generated. In passing up the Platte we traveled principally at some distance from the stream. Near the river, and along some of its tributaries, swampy districts of country exist which might endanger the health of persons living in their vicinity during the summer and autumn. I noticed long marshy tracts of this kind overgrown with heavy vegetation along the Loup Fork at this point. Soon after our encampment a good deal of bilious derangement prevailed in the party, and the presence of miasmatic poisons was soon made apparent in the occurrence of a number of cases of intermittent fever. Nearly all of the party experienced unpleasant disturbances of health here. The season had been unusually wet and the heat was extreme. Vegetation was consequently developed very rapidly, and it was, therefore, not difficult to account for the early appearance of disease among us. Under ordinary circumstances I would consider this region as healthy as most prairies, but the past seasons were particularly favorable to the development of malaria. All of the cases, however, that were treated here yielded readily, and when we commenced our journey up the Loup Fork no complaint was heard.

We seemed, however, peculiarly unfortunate in the start; for, a few days after we had got finally under way, the most serious case of sickness which we had to encounter during the trip commenced. On July 23, May, a teamster, exhibited the symptoms of fever, and it soon became apparent that this man must suffer a long and severe illness; under the most favorable circumstances his chances for recovery would have been considered few, and the circumstances under which we were of necessity placed tended greatly to diminish those chances. Delay was out of the question, as his case, if it resulted favorably, would require at least a fortnight, and we therefore placed him in the best situation that was possible in traveling, and did all in our power to promote his recovery. This case was an interesting one to the medical practitioner; it was one of those in which the signs and symptoms of typhoid and of remittent bilious fevers were intimately blended. Delirium commenced early, with stupor, diarrhea, and that peculiar condition of the tongue and mouth noticed in typhoid fever; with these some of the common symptoms of remittent fever were exhibited, and although the attack could not be cut short by quinia, its violence was greatly modified by that agent. The sickness of this man embarrassed our progress seriously, but after nearly three weeks of trouble and anxiety with his case we were gratified to note his convalescence. A

halt of three days during the most excited period of his disease tended greatly to promote a favorable termination. May was hauled the entire distance to Fort Laramie, not being able to perform any duty until we reached that point. On the 8th of August I was attacked with bilious remittent fever myself, and can testify from experience to the inconvenience from being sick on the prairies. My attack was not severe, and yielded in eight or ten days. These and the cases of intermittent were the only cases of fever that occurred in the party during the season.

The country through which we passed, up to this point, was along the Loup Fork. That portion of it most favorable to the production of fever is near its mouth. As you approach the sources of the river there are fewer wet tracts near the stream, and the country generally is not so flat. I notice the marshes particularly, as that is the only condition observed which could interfere with the health of the population if the country were inhabited. These are not numerous after you leave the mouth of the river some distance, and there is nothing to warrant the inference that the country is not highly favorable to health.

Indeed, in most respects, this region, so far as health is concerned, may be considered as highly favored. As you approach the elevated regions near the mountains, the atmosphere is exceedingly dry and pure. Much has been said of the favorable effects of a residence in this region upon persons laboring under pulmonary diseases. As this far-western region becomes more generally known, I think the subject will attract greater attention. I think the rational explanation of the improvement in consumptive cases that has been noted in this quarter is found in the dryness of the atmosphere. Sudden changes of temperature here, if not less frequent than in some of our Eastern States, are certainly not productive of the same bad consequences to the invalid. The lungs of those who are suffering with phthisis are here free from that constant irritation to which they are subjected in an atmosphere loaded with moisture; and the feeling of buoyancy and strength that is imparted encourages the invalid to make new exertions to promote recovery. A residence in such an atmosphere, combined with habits of active exercise, and constant living in the open air, might, in some cases I am sure, be productive of the best results. An intelligent friend, now residing at Fort Laramie, informed me that in his youth he was attacked with phthisis, that horrible disease being hereditary in his family. He was rapidly declining, and went to this far-western region in hope that the climate might prove beneficial. He made his home among the wandering bands of Indians, and avoided none of the exposure incident to such a life. He lay constantly in the open air, and took as much exercise as possible. His health improved, and in a year or two he was entirely restored, and is now residing at Fort Laramie a strong and healthy man. I have heard of many other cases similarly restored. In New Mexico consumption is unknown, I am informed, as a disease originating in the country, where the climate has the additional advantage of being warm.

During the extremely hot weather that continued during our journey up the Loup Fork, our party suffered very little with diarrhea or dysentery. A number of cases of the former occurred, but only a few required any treatment, and but a single case of dysentery, which was mild. After reaching Fort Laramie, those who had been sick rapidly recovered, and when we left that post all of the party were in excellent health.

During the fine weather that continued for a few weeks in the beginning of the fall no cases of sickness occurred. In October the weather

became inclement, and was very cold and wet. During our trip down the Niobrara no complaint was heard, except in some chronic cases, which were somewhat aggravated by the bad weather and exposure, and when the party reached Fort Randall all were in good health. Several of the soldiers had suffered from scurvy during the summer; these improved during the trip down the Niobrara, along which stream we found an abundance of plums and grapes. After leaving Fort Randall, (November 7,) the members of the party were attacked with influenza, and this disease prevailed during the entire trip from Randall to Leavenworth, and only four or five members of the party escaped an attack. Some of the men, who were much exposed to the inclement weather that we experienced on the trip, suffered severely, and at times a sufficient number were not off of the sick-list to carry on the train property. All recovered, however, and when we reached Leavenworth the party was in good health. Below is an enumeration of the most important cases treated during the season. Many trifling cases occurred of which no note was taken.

Diseases.	No. cases.	Results.
Intermittent fever	5	Recovered.
Bilious remittent	2	Recovered.
Diarrhea	5	Recovered.
Dysentery	1	Recovered.
Gonorrhea, acute	3	Recovered.
Orchites	1	Recovered.
Gleet	3	Recovered.
Chronic cystitis	1	Recovered.
Diabetes	1	Improved.
Granular conjunctivitis	1	Improved.
Tarsal ophthalmia	1	Recovered.
Influenza	11	Recovered.

Respectfully,

SAMUEL H. MOFFITT,
Physician to Expedition.

Lieut. G. K. WARREN,
Topographical Engineers.

EXPLORATIONS IN NEBRASKA AND DAKOTA.

CATALOGUE OF THE COLLECTIONS

IN

GEOLOGY AND NATURAL HISTORY,

OBTAINED BY

THE EXPEDITION UNDER COMMAND OF LIEUT. G. K. WARREN,
TOPOGRAPHICAL ENGINEERS,

BY

F. V. HAYDEN, M. D.

WASHINGTON, D. C., *November* 28, 1858.

SIR: In compliance with your request I have prepared a catalogue of the collections in geology and natural history, obtained in Nebraska and portions of Kansas, during several expeditions to those Territories under your command.

The list cannot be made out at this time as complete as could be desired, but it will be at once evident to all that the amount of new and valuable material thus secured, will, when properly studied and illustrated, form a large and positive addition to science. Of the fossil *Mollusca* collected, most of the new species have been indicated in scientific journals by my associate, Mr. Meek, and myself, and about seven hundred figures prepared, making, when arranged for the engraver, about fifty quarto plates. The fossil plants from Cretaceous formation No. 1 will also be included in the volume, and consist of eighteen species, all of which are supposed to be new to science. The fossil plants of the Tertiary era, of which there is a large series, remarkably well preserved and of great beauty, have not yet been studied to any extent. We simply know that they comprise about fifty species, all of which are supposed to be new, and would alone form a good-sized quarto volume. Descriptions and suitable illustrations of these plants will be made during the winter or spring.

The fossil *Mollusca* are arranged in their stratigraphical order, thus bringing at once before the geologist the characteristic fossils of each formation known in the Northwest, fromthe Carboniferous to the Tertiary, inclusive. The work will thus form a standard of reference for those who may wish to study the geology of the West, and will enable the explorer, even though but moderately versed in the science, to determine the age of the formations over which he may be traveling.

The fossil *Vertebrata*, which are very numerous in species, a large proportion of which were entirely new to science, have been placed in the hands of Dr. Leidy, the great comparative anatomist of Philadelphia, who informs us that the drawings are nearly ready for the engraver.

The following is a list of the memoirs already published in the transactions of scientific societies on the geology and paleontology of Nebraska and Kansas, by F. B. Meek and F. V. Hayden:

1. Descriptions of sixty-three new species of *Acephala*, *Gasteropoda*, and *Cephalopoda*, from the Cretaceous formation of Nebraska Territory.—(Proceedings of the Academy of Natural Sciences Philadelphia, March, 1856, p. 16.)

2. Descriptions of new species of *Acephala* and *Gasteropoda* from the Tertiary formations of Nebraska Territory, with some general remarks on the geology of the country about the sources of the Missouri River.—(Proc. Acad. Nat. Sci. Pa., June, 1856, p. 16.)

3. Descriptions of new fossil species of *Mollusca*, collected by Dr. F. V. Hayden in Nebraska Territory, together with a complete catalogue of all the remains of *Invertebrata* hitherto described and identified from the Cretaceous and Tertiary formations of that region.—(Proc. Acad. Nat. Sci. Pa., November, 1856, p. 22.)

4. Descriptions of new species and genera of fossils collected by Dr. F. V. Hayden in Nebraska Territory, under the direction of Lieut. G. K. Warren, United States Topographical Engineers, with some remarks on the Tertiary and Cretaceous formations of the Northwest, and the parallelism of the latter with those of other portions of the United States and

Territories. Communicated by permission of the Secretary of War.—(Proc. Acad. Nat. Sci. Pa., May, 1857, p. 34.)

5. Descriptions of new organic remains from Northeastern Kansas, indicating the existence of Permian rocks in that Territory.—(Transactions of the Albany Institute, Vol. IV—read March 2, 1858.)

6. Descriptions of new organic remains collected in Nebraska Territory in the year 1857, by Dr. F. V. Hayden, geologist to the exploring expedition under the command of Lieut. G. K. Warren, Topographical Engineers, United States Army, together with some remarks on the geology of the Black Hills and portions of the surrounding country.—(Proc. Acad. Nat. Sci. Pa., March, 1858, p. 19.)

By F. V. HAYDEN:

7. Notes explanatory of a map and section, illustrating the geological structure of the country bordering on the Missouri River, from the mouth of the Platte to Fort Benton, in latitude 47° 30′ N., longitude 110° 30′ W.—(Proc. Acad. Nat. Sci. Pa., May, 1857, p. 10.)

8. Notes on the geology of the Mauvaises Terres of White River.—(Proc. Acad. Nat. Sci. Pa., June, 1857, p. 8.)

9. Explanations of a second edition of a geological map of Nebraska and Kansas, based upon information obtained during an expedition to the Black Hills, under the command of Lieut. G. K. Warren, Topographical Engineers, United States Army.—(Proc. Acad. Nat. Sci. Pa., June, 1868, p. 22.)

Dr. Leidy's descriptions of the new *Vertebrata*, collected from time to time, are distributed through various numbers of the Proceedings of the Philadelphia Academy for the years 1856, 1857, and 1858. The principal paper was published in March last, and bears the following title: "Notice of remains of extinct *Vertebrata* from the valley of the Niobrara River, collected by Dr. F. V. Hayden, geologist to the expedition under the command of Lieut. G. K. Warren, Topographical Engineers, United States Army, by Joseph Leidy, M. D."

The details of the geology of the regions explored will be reserved for your final report.

The following is the number of species comprised in the collection from each department of natural history as far as they have been studied, up to this time. The catalogue includes none of the insects, of which there are many species, nor the cryptogamic plants, which have not yet been identified:

Number of species of fossil *Vertebrata*	77
Number of species of fossil *Mollusca*	251
Number of fossil plants	70
Number of minerals and geological specimens	423
Number of species of recent mammals	47
Number of species of birds	186
Number of species of recent *Mollusca*	65
Number of species of fishes	24
Number of species of reptiles	28
Number of species of recent plants	1,500

Of the fossil *Mollusca* named in this catalogue, 186 species were new to science; upwards of 50 of the *Vertebrata* and all the fossil plants are supposed to be new. A number of rare or entirely new species were discovered in all departments of natural history. The specimens are now deposited in the museum of the Smithsonian Institution, and in

behalf of the expedition I would return my grateful thanks to the distinguished Secretary of that institution for the numerous facilities he has very kindly afforded for their investigation.

F. V. HAYDEN,
Geologist and Naturalist.

Lieut. G. K. WARREN,
Topographical Engineers, U. S. A.

GEOLOGY AND PALEONTOLOGY.

In order to render this catalogue something more than a mere list of species, I have attempted to present a summary of the geological formations, as far as they are at present known, in Kansas and Nebraska. This will render more clear the geological relations of the fossils from the Potsdam sandstone to the Pliocene Tertiary.

The rocks of Nebraska, as far as they are at present known, are referrible to the following geological systems:

1. Metamorphosed azoic rocks, including coarse granite.
2. Lower Silurian. (Potsdam sandstone.)
3. Devonian.
4. Carboniferous.
5. Permian.
6. Jurassic.
7. Cretaceous, Upper, Middle, and Lower, (including Wealden?)
8. Tertiary.
9. Post Pliocene or Quaternary.

Passing over the granitic and azoic rocks, we find that the Potsdam sandstone, or the lowest member of the Silurian period, is quite well developed in the Black Hills. It is there brought to the surface by the upheaval of the igneous rocks, and forms a narrow belt around the most elevated portion of the Black Hills. This formation, though well known and studied in many parts of the United States, had not been discovered in the region of the Rocky Mountains prior to Lieutenant Warren's exploration of the Black Hills, during the summer of 1857. So far as is yet understood, this member of the geological series has revealed the first indications of organic life on our planet. The following species of fossils, belonging to what Barrande, the great paleontologist of Bohemia, has called the "Primordial Fauna," have been identified from the Potsdam sandstone of the Black Hills and suitable illustrations prepared: *Lingula antiqua*, (Hall;) a species of *Lingula* very similar to *L. prima*, (Conrad,) occurs in vast numbers, forming layers several inches in thickness; a species of *Obolus*, very closely allied to *O. oppolinus*, as figured by Muchison and De Verneuil in their work on the geology of Russia, and fragments of a trilobite, apparently identical with one of the forms figured by Dr. Owen from the Potsdam sandstone of Minnesota.

The discovery of this formation in the far West is a matter of the highest geological interest, and its existence in the Black Hills being now well established, we may look for its discovery in many other parts of the West, and it will undoubtedly be found holding a similar position all along the eastern slope of the Rocky Mountains.

No well-marked fossils have yet been obtained from the supposed Devonian period in Kansas or Nebraska, and its existence there is, with our present evidence, quite problematical.

A large collection of fossils was secured from the Carboniferous group, in the Black Hills, near the Laramie range of mountains, in the south-eastern portion of Nebraska and in various parts of Kansas. A large and fine collection of Carboniferous and Permian fossils were collected by Mr. F. B. Meek and the writer, in Kansas, during the past summer. These fossils are now being investigated at the Smithsonian Institution. I will therefore omit a catalogue of the Carboniferous fossils until our results are more complete. The organic remains from all the localities above mentioned, as well as from many other parts of the West and South-west, have several species in common, and the others are of the same types; so that the evidence seems to be conclusive that these limestones are all of the same geological age, and belong to the true Coal-Measures.

One of the most interesting series of rocks in the West are best developed in Kansas, but most probably exist near the Black Hills also. These rocks were at first supposed to be the American representatives of the Permian group of Europe; but much more study will be required to give them their exact position in the geological scale. A large collection of fossils from these rocks has been studied with considerable care by Mr. Meek and the writer, and they seem to warrant the conclusion that by far the greater portion of the strata of the so-called Permian in the West hold an intermediate position between the Carboniferous and the Permian of the Old World. A thorough and clear solution of this problem becomes, therefore, the most interesting feature in American geology at the present time.*

The following species, most of which are of Permian types, have been described by Mr. Meek and the writer, and published in the Transactions of the Albany Institute. The larger part of them were obtained by Mr. Hawn and Dr. Cooper in Kansas, and the remainder were collected by the writer in Nebraska, opposite the northern boundary of the State of Missouri, and in the Black Hills, while attached to Lieutenant Warren's party:

1. *Monotis Hawni*, Meek and Hayden.
2. *Myalina* (*Mytilus*) *perattenuatus*, Meek and Hayden.
3. *Bakevellia parva*, Meek and Hayden.
4. *Edmdonia? Calhouni*, Meek and Hayden.
5. *Pleurophorus? occidentalis*, Meek and Hayden.
6. *Pleurophorus* (*Cardinia*) *subcuneata*, Meek and Hayden.
7. *Lyonsia* (*Panopaea*) *concava*, Meek and Hayden.
8. *Panopæa Cooperi*, Meek and Hayden.
9. *Nautilus eccentricus*, Meek and Hayden.
10. *Leda* (*Nucula*) *subscitula*, Meek and Hayden.

A fine series of fossils, which we have supposed to be of Jurassic age, were obtained from the Black Hills during the summer of 1857. None of the species, so far as examined, seem to be positively identical with those found in the Jura of Europe, but they all belong to the same genera, and many of the species are closely allied to forms which are characteristic of that period in the Old World. In order to render more clear our opinion that these fossils are Jurassic, I will repeat, in connection with the names of each species, the evidence derived from the study of the fossils, which has already been published by Mr. Meek and myself, in March, 1858:

* The upper portion of the so-called Permian in Kansas seems to be destitute of true Carboniferous fossils, but contains an abundance of those belonging to Permian types. We are therefore of the opinion that the upper two or three hundred feet of these rocks are probably on a parallel with the Permian of Europe, and that the intermediate group which we have mentioned fills up the hiatus between the Carboniferous and Permian of the Old World.

1. *Lingula brevirostris*, Meek and Hayden.

2. *Avicula (Monotis) tenuicostata*, M. and H., a closely-allied representative of the Liassic species *Monotis sustriata*, Munster.

3. *Mytilus pertenuis*, M. and H.

4. *Arca (Cucullea) inornata*, M. and H. Very similar to *C. Munsteri* (Leiten) from the Lias.

5. *Panopœa (Myacites) subelliptica*, M. and H. Very similar to the Liassic forms, *M. liassensis* and *M. Alduininus* of Quensted.

6. *Ammonites cordiformis*, M. and H., may be regarded as the American representative of the European Liassic species, *A. cordatus* of Sowerby.

7. *Ammonites Henryi*, M. and H.

8. *Belemnites densus*, M. and H. This species is so closely allied to the oolitic *B. eccentricus*, Blainville, that we are in great doubt whether it is really distinct. It is also allied to the *B. panderianus* of d'Orbigny, from the Lower Oolite.

9. *Pentacrinus asteriscus*, M. and H., so closely resembles the *P. scalaris*, Golfuss, that it was with considerable hesitation that it was described as new.

From the above evidence we think we may safely consider the group of rocks from which the fossils were collected as the American representative of the Jurassic rocks of the Old World. We have still in the the collection several undescribed species, which are all of Jurassic types.

There is, also, at the base of No. 1, in the Black Hills, a fresh-water deposit, which we are in doubt whether to place with the Jurassic or Lower Cretaceous. The fossils are a species of *Unio* (*U. nucalis*, Meek and Hayden,) and a small *Planorbis*.

Near the mouth of the Judith River, on the Missouri, is a most interesting series of strata, deposited in a basin-like depression in Cretaceous formation, No. 1. These beds are composed of sand, sandstone, clays, and very impure lignite, with remains of fresh-water, land, and a few estuary shells; also, remains of saurians, turtles, fishes, &c. The exact age of this deposit has not yet been determined, the *Mollusca* pointing to the conclusion that it belongs to the Tertiary period, while the *Vertebrata* are considered by Dr. Leidy to belong to Wealden types, and allied to those forms discovered by Dr. Mantell in the Wealden strata of England. With evidence so conflicting before us, it will be necessary to make a second exploration of that region before we can come to any positive conclusion as to its age. The following section, in descending order, will represent the different beds with sufficient accuracy and detail for our present purpose:

5 N D

Section of fresh-water and estuary deposits near the mouth of Judith River.

A.	80 feet...	Yellow arenaceous marl passing downwards into gray grit, with small seams of lignite; contains great numbers of *Ostrea subtrigonalis?*, *Cyrena occidentalis*, *Melania convexa*, &c.
B.	10 feet...	Impure lignite, containing much sand. *Ostrea subtrigonalis?* and silicified wood.
C.	80 feet...	Alternations of sand and clay, with particles of lignite; also reddish argillaceous concretions with a few saurian teeth, and fresh-water shells.
D.	20 feet...	Alternate strata of sand and clay, with impure lignite and silicified wood in a good state of preservation.
E.	100 feet...	Variable bed, consisting of alternations of sand and clay with large concretions containing great numbers of *Melania*, *Paludina*, *Helix*, *Planorbis*, *Cyclas*, &c., associated with saurian remains resembling the *Iguanodon* and *Megalosaurus*, *Trionyx*, &c.
F.	25 feet...	Alternations of impure lignite and yellowish-brown clay, the latter containing great numbers of *Unio*, *Paludina*, *Melania*, *Cyclas*, and the fresh remains referred by Dr. Leidy to the genus *Lepidotus*.
G.	100 feet...	Ferruginous sand and clay, having in upper part a seam three or four inches in thickness, nearly made up of shells of *Unio*. Lower part ferruginous and coarse gray grit, with a seam near the base entirely composed of remains of *Unio Danai*, *U. Dewyi*, and *U. subspatulata*.

Table showing the stratigraphical position of the fossils from the "Bad Lands" of the Judith.

	A.	B.	C.	D.	E.	F.	G.
VERTEBRATA.							
1. *Paleoscincus costatus*, Leidy					*		
2. *Trachodon mirabilis*, Leidy				*	*		
3. *Troodon formosus*, Leidy					*		
4. *Deinodon horridus*, Leidy				*	*		
5. *Crocodilus humilis*, Leidy				*	*		
6. *Trionyx foveatus*, Leidy					*		
7. *Lepidotus occidentalis*, Leidy						*	
8. *Lepidotus Haydeni*, Leidy						*	
MOLLUSCA.							
9. *Cyrena occidentalis*, Meek and Hayden	*						
10. *Corbula subtrigonalis*, Meek and Hayden	*						
11. *Corbula perundata*, Meek and Hayden	*						
12. *Physa subelongata*, Meek and Hayden					*		
13. *Paludina vetula*, Meek and Hayden	*						
14. *Paludina Conradi*, Meek and Hayden	*						
15. *Melania subtortuosa*, Meek and Hayden			*				
16. *Melania omitta*, Meek and Hayden							*
17. *Melania subleavis*, Meek and Hayden							*
18. *Melania invenusta*, Meek and Hayden	*						
19. *Vitrina obliqua*, Meek and Hayden					*		
20. *Helix occidentalis*, Meek and Hayden					*		
21. *Helix vitrinoides*, Meek and Hayden					*		
22. *Planorbis tenuivolvis*, Meek and Hayden					*		
23. *Planorbis amplexus*, Meek and Hayden			*				
24. *Unio Danai*, Meek and Hayden							*
25. *Unio Deweyanus*, Meek and Hayden							*
26. *Unio subspatulatus*, Meek and Hayden							*

The Cretaceous group, which occupies so extensive an area on the Upper Missouri, has been separated into five divisions, which present well-marked lithological differences, and contain, for the most part, distinct species of organic remains.

Vertical section of the Cretaceous formations of Nebraska Territory, so far as determined.

CRETACEOUS SYSTEM.	No. 5.	Gray and yellowish arenaceous clays and sandstones, sometimes weathering to a pink color, containing *Belemnitella bulbosa, Nautilus Dekayi, Ammonites placenta, A. lobatus, Scaphites Conradi, Baculites ovatus*, and great numbers of other marine *Mollusca*.		Moreau trading-post and under the Tertiary at Sage and Bear Cr'ks. Fox Hills.	100 to 150 feet.
	No. 4.	Bluish and dark-gray plastic clays, containing *Nautilus Dekayi, Ammonites placenta, Baculites ovatus*, and *B. compressus*, with numerous other marine *Mollusca*—remains of *Mosasauras*.		Great area about Ft. Pierre and along the Missouri below there. Under No. 5 at Sage and Bear Cr'ks. Great Bend of the Missouri. Near Milk and Muscle Shell Rivers.	350 feet.
	No. 3.	Dark, very fine unctuous clay, containing much carbonaceous matter, with veins and seams selenite, sulphuret of iron, fish and scales, (local.)	20 feet.	Bluffs along the Missouri, below the Great Bend. Extends to Big Sioux River, and occurs along the latter stream.	150 feet.
		Lead-gray calcareous marl, weathering above to a yellowish tint. Scales and other remains of fishes—*Ostrea congesta*—passing downward into—	100 feet.		
		Light-gray or yellowish limestone, containing great numbers of *Inoceramus problematicus*, fish-scales, and *Ostrea congesta*.	30 feet.		
	No. 2.	Dark-gray laminated clay scales and other remains of fishes, small Ammonites, *Inoceramus problematicus?*, *Serpula*, small oyster-like *O. congesta*, &c.		Along the Missouri Bluffs from ten miles above James River to Big Sioux River.	90 feet. Wanting in
	No. 1.	Yellowish and reddish friable sandstone, with alternations of dark and whitish clays. Seams and beds of impure lignite, fossil wood, impressions of dicotyledonous leaves, *Solen, Pectunculus, Cyprina*, &c. Lower Cretaceous.		Near the mouth of Big Sioux River and between there and Council Bluffs. Near Judith River.?	90 to 100 feet, or more.

Formation No. 1 seems to constitute paleontologically an independent division, none of its organic remains ranging in other formations above or below. Nos. 2 and 3 seem to form one group, the *Ostrea congesta* and *Inoceramus problematicus* passing from one to the other.

Divisions 4 and 5, which are the most fossiliferous formations on the Upper Missouri, contain many species in common, especially of the *Cephalopoda*, and therefore form a third group.

The Cretaceous system, as developed on the Upper Missouri, therefore forms lithologically five well-marked subdivisions, while paleontologically it admits of separation into three independent groups. The age and geological position of divisions 2, 3, 4, and 5, have been sufficiently attested by the numerous species of organic remains which have been published, from time to time, by my associate, Mr. Meek, and myself. In regard to the age of No. 1 much doubt existed, until we had an opportunity to examine a fine series of dicotyledonous leaves, which I had discovered in this formation near Blackbird Hill, on the Missouri, while attached to Lieutenant Warren's party, in the spring of 1857. These leaves proved to us that the formation under consideration could not be older than Cretaceous, and this conclusion was published by us in several of our later papers. Although the evidence that it is of Lower Cretaceous age was perfectly satisfactory to us, some writers have considered it Triassic, while others have regarded it as Jurassic and even Miocene Tertiary. In a late publication addressed to Mr. Meek and the writer, Professor Marcou says: "Allow me respectfully to suggest to you that I cannot see anything of Cretaceous in what you call No. 1 of your Nebraska section. It appears to me that you put in your No. 1, or Lower Cretaceous, all sorts of strata of different ages, except true Cretaceous rocks." That the rocks in question are not newer than Cretaceous I will endeavor to prove, both from stratigraphical and paleontological evidence.

Evidence from stratigraphical position.

Near the old Otoe village, on the Platte River, about five miles above its mouth, No. 1 rests directly upon limestone strata of the true Coal-Measures; and at this point I found a species of *Laurus*, apparently identical with a plant obtained near the mouth of the Big Sioux, and at Blackbird Hill. Near De Soto, about twenty miles above Omaha City, the Carboniferous limestone ceases to appear, and No. 1 rests with concordant stratification upon it. There is not the slightest disturbance of the strata in this region, but they dip gently toward the northwest. I traced No. 1 with great care to Blackbird Hill, about sixty miles above De Soto, and found a few plants at different localities. At Blackbird Hill an extensive quarry had been opened to procure stone for building the large mission establishment at that place. From this quarry I collected the fine series of dicotyledonous leaves, before mentioned. I then directed my course toward the mouth of the Big Sioux, about forty miles further up the Missouri, and examined the country with great care. The red sandstone, No. 1, was the principal rock in that region, but upon the summits of the bluffs, resting upon the sandstone apparently, I often found layers of a yellowish-white, rather soft limestone, fully charged with *Inoceramus problematicus* and fish-remains. Near Sioux City, about two miles below the mouth of Big Sioux River, is a vertical section of No. 1, rising about thirty feet above the water's edge. At the base of this vertical cut I collected a number of leaves, similar to those observed at Blackbird Hill. From the high bluffs, bordering upon the Missouri, the inhabitants of this region obtain immense quantities of the calcareous rock of No. 3, composed almost entirely of *I. problematicus*, and convert it into lime. On the Big Sioux River, about six miles above its mouth, I took the following section of the strata from a vertical cut with considerable care:

Yellow marl, a recent deposit.

No. 3. Shaly limestone, gradually passing into bed below, with an abundance of *Inoceramus problematicus*, and fish-remains.

No. 2. Dark plastic shaly clay, with ferruginous concretions.

No. 1. *a*—Yellow friable sand.

b—Earthy lignite, 6 inches.

c—Variegated sandstones and clays, extending to water's edge, with dicotyledonous leaves.

Section near the mouth of Iowa Creek.

No. 3. Gray and yellow marl, with immense numbers of *I. problematicus*, *Ostrea congesta*, and fish-remains.

No. 2. Dark plastic clay with *Ammonites* resting concordantly upon the bed below.

No. 1. Sandstone just above water-edge.

At this last locality I found in No. 1 the plant which Professor Heer refers to, *Laurus primigenia*, and a shell which we have described as *Solen Dakotaensis*. Here No. 1 passes from sight beneath the well-known Cretaceous bed No. 2.

With regard to our No. 1 holding a position beneath well-marked Cretaceous beds, I think I need not say anything further.

Paleontological evidence.

The fine series of fossil plants from No. 1, which I collected on the Missouri, as well as those obtained by my friend, Mr. Meek, and myself, during our recent trip to Kansas, were placed in the hands of our friend, Dr. J. S. Newberry, the well-known authority in fossil botany, and from him we received the following notes:*

"They include so many highly-organized plants, that were there not among them several genera exclusively Cretaceous, I should be disposed to refer them to a more recent era."

"A single glance is sufficient to satisfy any one they are not Triassic. Up to the present time no angiosperm dicotyledonous plants have been found in rocks older than Cretaceous, while of the eighteen species which comprise your collection, sixteen are of this character."

"The species of your fossil plants are probably all new, though generally closely allied to the Cretaceous species of the Old World. From the limited study I have given them, I have referred them to the following genera:

Sphenopteris.	*Pyrus.*
Abietites.	*Alnus.*
Acer.	*Salix.*
Fagus.	*Magnolia.*
Populus.	*Credneria.*
Cornus.	*Ettingshausinia.*
Liriodendron.	

"Of these the last two are exclusively Cretaceous and highly characteristic of that formation in Europe."

From the evidence which we have given, we think we are warranted in regarding our No. 1 as Cretaceous, and probably of Lower Cretaceous age. This matter will be discussed more fully hereafter. The red sandstone at the mouth of Big Sioux is the type of our No. 1, and its relations to the sandstone strata, near the Judith River, are not positively determined.

* Dr. Newberry's remarks will appear in the January number of Silliman's Journal with our joint paper.

Table showing the stratigraphical position of the Cretaceous fossils hitherto identified from Nebraska Territory.

	Formations in ascending order.				
	1	2	3	4	5
1. GENUS CALLIANASSA.					
1. *Callianassa Danai*, Hall and Meek	----	----	----	*	----
2. GEN. BELEMNITELLA.					
2. *Belemnitella mucronata*, Schlotheim	----	----	----	*	----
3. *Belemnitella? halhaser*, Meek and Hayden	----	----	----	*	----
3. GEN. NAUTILUS.					
4. *Nautilus De Kayi*, Morton	----	----	----	*	*
4. GEN. AMMONITES.					
5. *Ammonites placenta*, De Kay	----	----	----	*	*
6. *Ammonites lobatus*, Tuomy	----	----	----	*	*
7. *Ammonites opalus*, Owen	----	----	----	----	----
8. *Ammonites complexus*, Hall and Meek	----	----	----	*	----
9. *Ammonites percarinatus*, Hall and Meek	----	*	*	----	----
10. *Ammonites Halli*, Meek and Hayden	----	----	----	*	----
5. GEN. TURRILITES.					
11. *Turrilites Nebrascensis*, Meek and Hayden	----	----	----	----	----
12. *Turrilites Cheyennensis*, Meek and Hayden	----	----	----	----	----
13. *Turrilites umbilicatus*, Meek and Hayden	----	----	----	----	----
14. *Turrilites (Helicoceras) cochleatus*, Meek and Hayden	----	----	----	----	----
6. GEN. ANCYLOCERAS.					
15. *Ancyloceras? Nicolletti*, Hall and Meek	----	----	----	*	----
16. *Ancyloceras? Mortoni*, Hall and Meek	----	----	----	*	----
17. *Ancyloceras (Hamites) uncus*, Meek and Hayden	----	----	----	*	----
7. GEN. PTYCHOCERAS.					
18. *Ptychoceras Mortoni*, Meek and Hayden	----	----	----	*	----
8. GEN. HELICOCERAS.					
19. *Helicoceras tenuicostatus*, Meek and Hayden	----	----	----	*	----
20. *Helicoceras? tortus*, Meek and Hayden	----	----	----	*	----
9. GEN. BACULITES.					
21. *Baculites ovatus*, Say	----	----	----	*	*
22. *Baculites compressus*, Say	----	----	----	*	*
23. *Baculites grandis*, Hall and Meek	----	----	----	----	*
10. GEN. SCAPHITES.					
24. *Scaphites Conradi*, Morton, sp	----	----	----	----	*
25. *Scaphites Mandenensis*, Morton, sp	----	----	----	----	*
26. *S. Nicolletti*, Morton, sp	----	----	----	*	*
27. *S. nodosus*, Owen	----	----	----	*	----
28. *S. larviformis*, Meek and Hayden	----	*	----	*	----

Table showing the stratigraphical position, &c.—Continued.

	Formations in ascending order.				
	1	2	3	4	5
11. GEN. SCALARIA.					
29. *S. cerithiformis*, Meek and Hayden	----	----	----	----	*
12. GEN. TURRITELLA.					
30. *T.? convexa*, Meek and Hayden	----	----	----	*	----
31. *T. Moreauensis*, Meek and Hayden	----	----	----	----	*
13. GEN. ACTEON.					
32. *A. concinnus*, Hall and Meek	----	----	----	*	*
33. *A. subellipticus*, Meek and Hayden	----	----	----	*	----
34. *A. (Solidula) attenuata*, Meek and Hayden	----	----	----	*	*
14. GEN. AVALANA.					
35. *A. subglobosa*, Meek and Hayden	----	----	----	----	*
15. GEN. NATICA.					
36. *N. Tuomyana*, Meek and Hayden	*	----	----	----	----
37. *N. obliquata*, Hall and Meek	----	----	----	*	----
38. *N. cocinna*, Hall and Meek	----	----	----	*	----
39. *N. paludinaformis*, Hall and Meek	----	----	----	*	----
40. *N. ambigua*, Meek and Hayden	----	----	----	----	*
41. *N. subcrassa*, Meek and Hayden	*	----	----	----	----
42. *N. occidentalis*, Meek and Hayden	----	----	----	----	*
43. *N. Moreauensis*, Meek and Hayden	----	----	----	----	*
16. GEN. SOLARIUM.					
44. *S. flexuistriatum*, Evans and Shumard	----	----	----	*	----
17. GEN. TURBO.					
45. *T. Nebrascensis*, Meek and Hayden	----	----	----	*	----
46. *T. tenuilineatus*, Meek and Hayden	----	----	----	*	----
18. GEN. ROSTELLARIA.					
47. *R. Nebrascensis*, Evans and Shumard	----	----	----	*	----
48. *R. fusiformis*, Hall and Meek	----	----	----	*	----
49. *R. biangulata*, Meek and Hayden	----	----	----	*	----
19. GEN. FUSUS.					
50. *F. Shumardi*, Hall and Meek	----	----	----	*	----
51. *F. tenuilineatus*, Hall and Meek	----	----	----	*	----
52. *F. Dakotaensis*, Meek and Hayden	----	----	----	----	*
53. *F. Galpinianus*, Meek and Hayden	----	----	----	----	*
54. *F. contortus*, Meek and Hayden	----	----	----	----	*
55. *F. Culbertsoni*, Meek and Hayden	----	----	----	----	*
56. *F. flexuocostatus*, Meek and Hayden	----	----	----	----	*
57. *F. Newberryi*, Meek and Hayden	----	----	----	----	*
58. *F. Vaughani*, Meek and Hayden	----	----	----	----	*
59. *F. subturritus*, Meek and Hayden	----	----	----	*	----
60. *F. intertextus*, Meek and Hayden	----	----	----	*	*
61. *F. (Pleurotoma) Scarboroughi*, Meek and Hayden	----	----	----	----	*

Table showing the stratigraphical position, &c.—Continued.

	Formations in ascending order.				
	1	2	3	4	5
20. GEN. BUSYCON.					
62. *B. Bairdi*, Meek and Hayden	----	----	----	----	*
21. GEN. FASCIOLARIA.					
63. *F. cretacea*, Meek and Hayden	----	----	----	----	*
64. *F. buccinoides*, Meek and Hayden	----	----	----	----	*
22. GEN. BUCCINUM.					
65. *B.? vinculum*, Hall and Meek	----	----	----	*	----
66. *B. constrictum*, Hall and Meek	----	----	----	*	----
23. NEW GEN. PSEUDOBUCCINUM, Meek and Hayden.					
67. *P. Nebrascensis*, Meek and Hayden	----	----	----	----	*
24. GEN. CAPULUS, Hall and Meek.					
68. *C. occidentalis*, Hall and Meek	----	----	----	*	----
69. *C. fragilis*, Meek and Hayden	----	----	----	----	*
25. GEN. HELCION.					
70. *H. borealis*, Morton, sp	----	----	----	*	----
71. *H. sexcucatus*, Meek and Hayden	----	----	----	*	----
72. *H. patelliformis*, Meek and Hayden	----	----	----	*	----
73. *H. alveolus*, Meek and Hayden	----	----	----	*	----
74. *H. subovatus*, Meek and Hayden	----	----	----	*	----
75. *H. carinatus*, Meek and Hayden	----	----	----	*	----
26. GEN. DENTALIUM.					
76. *D. gracilis*, Hall and Meek	----	----	----	*	----
77. *D. fragilis*, Meek and Hayden	----	----	----	*	----
27. GEN. BULLA.					
78. *B. volvaria*, Meek and Hayden	----	----	----	----	*
79. *B. minor*, Meek and Hayden	----	----	----	----	*
80. *B. occidentalis*, Meek and Hayden	----	----	----	*	----
81. *B. subcylindricus*, Meek and Hayden	----	----	----	*	----
28. GEN. XYLOPHAGA.					
82. *X. elegantula*, Meek and Hayden	----	----	----	*	----
83. *X. Stimpsoni*, Meek and Hayden	----	----	----	*	----
29. GEN. PHOLAS.					
84. *P. cuneata*, Meek and Hayden	----	----	----	----	*
30. GEN. TEREDO.					
85. *T. globosa*, Meek and Hayden	----	----	----	----	*
31. GEN. SOLEN.					
86. *S.? Dakotaensis*, Meek and Hayden	*	----	----	----	----

Table showing the stratigraphical position, &c.—Continued.

	Formations in ascending order.				
	1	2	3	4	5
32. GEN. PHOLODOMYA.					
87. *P. elegantula*, Evans and Shumard	----	----	----	*	----
88. *P. (Gonomya) Americana*, Meek and Hayden	----	----	----	----	*
89. *P. undata*, Meek and Hayden	*	----	----	----	----
90. *P. fibrosa*, Meek and Hayden	----	----	----	*	----
91. *P. subventricosus*, Meek and Hayden	*	----	----	----	----
33. GEN. PANOPEA.					
92. *P. occidentalis*, Meek and Hayden	*	----	----	----	----
34. GEN. SOLEMYA.					
93. *S. subplicata*, Meek and Hayden	----	----	----	----	*
35. GEN. MACTRA.					
94. *M. formosa*, Meek and Hayden	*	----	----	----	----
95. *M. Warrenana*, Meek and Hayden	----	----	----	----	*
96. *M. alta*, Meek and Hayden	*	----	----	----	----
36. GEN. TELLINA.					
97. *T.? Cheyennensis*, Meek and Hayden	*?	----	----	----	----
98. *T. equilateralis*, Meek and Hayden	----	----	----	*	----
99. *T. scitula*, Meek and Hayden	----	----	----	----	*
100. *T. subelliptica*, Meek and Hayden	----	----	----	----	*
101. *T. Prouti*, Meek and Hayden	----	----	----	*	----
102. *T. subtortuosa*, Meek and Hayden	*	----	----	----	----
37. GEN. CYTHEREA.					
103. *C. Missouriana*, Morton	----	----	----	*	----
104. *C. orbiculata*, Hall and Meek	----	*	----	----	----
105. *C. tenuis*, Hall and Meek	----	*	----	----	----
106. *C. Deweyi*, Meek and Hayden	----	----	----	----	*
107. *C. Nebrascensis*, Meek and Hayden	----	----	----	----	*
108. *C. pellucida*, Meek and Hayden	----	----	----	*	----
109. *C. Owenana*, Meek and Hayden	*	----	----	----	----
38. GEN. VENUS.					
110. *V.? circularis*, Meek and Hayden	----	----	----	*	----
39. GEN. LEDA.					
111. *L. ventricosa*, Meek and Hayden	----	----	----	----	*
112. *L. Moreauensis*, Meek and Hayden	----	----	----	----	*
40. NEW GEN. CORBULAMELLA, Meek and Hayden.					
113. *C. gregaria*, Meek and Hayden	----	----	----	*	----
41. GEN. THRACIA.					
114. *T.? gracilis*, Meek and Hayden	*	----	----	----	----
42. GEN. ASTARTE.					
115. *A. gregaria*, Meek and Hayden	----	----	----	----	*

Table showing the stratigraphical position, &c.—Continued.

	Formations in ascending order.				
	1	2	3	4	5
43. Gen. Crassatella.					
116. *C. Evansi*, Hall and Meek	----	----	----	*	----
44. Gen. Lucina.					
117. *L. subundata*, Hall and Meek	----	----	----	*	----
118. *L. occidentalis*, Meek and Hayden	----	----	----	*	----
45. Gen. Hettangia.					
119. *H. Americana*, Meek and Hayden	*	----	----	----	----
46. Gen. Cyprina.					
120. *C. arenaria*, Meek and Hayden	*	----	----	----	----
121. *C. cordata*, Meek and Hayden	----	----	----	----	*
122. *C. compressa*, Meek and Hayden	----	----	----	----	*
123. *C. ovata*, Meek and Hayden	----	----	----	----	*
124. *C. subtumida*, Meek and Hayden	----	----	----	*	*
47. Gen. Cardium.					
125. *C. speciosum*, Meek and Hayden	*	----	----	----	----
48. Gen. Nucula.					
126. *N. subnasuta*, Hall and Meek	----	----	----	*	----
127. *N. ventricosa*, Hall and Meek	----	----	----	*	----
128. *N. scitula*, Meek and Hayden	----	----	----	----	*
129. *N. Evansi*, Meek and Hayden	----	----	----	----	*
130. *N. equilateralis*, Meek and Hayden	----	----	----	----	*
131. *N. subplana*, Meek and Hayden	----	----	----	*	----
132. *N. cancellata*, Meek and Hayden	----	----	----	----	*
133. *N. planomarginata*, Meek and Hayden	----	----	----	----	*
134. *N. obsoletastriata*, Meek and Hayden	----	----	----	*	----
49. Gen. Pectunculus.					
135. *P. parvula*, Meek and Hayden	----	----	----	----	*
136. *P. subimbricatus*, Meek and Hayden	----	----	----	----	*
50. Gen. Cucullea.					
137. *C. Nebrascensis*, Owen	----	----	----	----	*
138. *C. cordata*, Meek and Hayden	----	----	----	----	*
139. *C. Shumardi*, Meek and Hayden	----	----	----	----	*
140. *C. exigua*, Meek and Hayden	----	----	----	*	----
51. Gen. Mytilus.					
141. *M. attenuatus*, Meek and Hayden	----	----	----	----	*
142. *M. Galpinianus*, Evans and Shumard	----	----	----	----	*
143. *M. subarcuatus*, Meek and Hayden	*	----	----	----	----
52. Gen. Avicula.					
144. *A. triangularis*, Evans and Shumard	----	----	----	*	----
145. *A. linguiformus*, Evans and Shumard	----	----	----	*	----
146. *A. Haydeni*, Hall and Meek	----	----	----	*	----

Table showing the stratigraphical position, &c.—Continued.

	Formations in ascending order.				
	1	2	3	4	5
53. GEN. GERVILIA.					
147. *G. subtortuosa*, Meek and Hayden	----	----	----	*	----
54. GEN. INOCERAMUS.					
148. *I. problematicus*, Schlothein	----	----	*	----	----
149. *I. Barabini*, Morton	----	----	----	*	----
150. *I. Sagensis*, Owen	----	----	----	----	----
151. *I. Nebrascensis*, Owen	----	----	----	*	----
152. *I. subleavis*, Hall and Meek	----	----	----	*	----
153. *I. convexus*, Hall and Meek	----	----	----	*	----
154. *I. tenuilineatus*, Hall and Meek	----	----	----	*	----
155. *I. Conradi*, Hall and Meek	----	*	----	----	----
156. *I. fragilis*, Hall and Meek	----	*	----	----	----
157. *I. ventricosus*, Meek and Hayden	*	----	----	----	----
158. *I. pertenuis*, Meek and Hayden	*	----	----	----	----
159. *I. incurvus*, Meek and Hayden	----	----	----	*	----
160. *I. umbonatus*, Meek and Hayden	----	----	----	*	----
55. GEN. PECTEN.					
161. *P. rigida*, Hall and Meek	----	----	----	*	----
162. *P. Nebrascensis*, Meek and Hayden	----	----	----	*	*
56. GEN. OSTREA.					
163. *Ostrea congesta*, Conrad	----	----	*	----	----
164. *Ostrea larva*, Lamark	----	----	----	*	----
165. *Ostrea patina*, Meek and Hayden	----	----	----	*	----
166. *Ostrea glabra*, Meek and Hayden	*	----	----	----	----
57. GEN. CAPRINELLA.					
167. *Caprinella coraloidea*, Hall and Meek	----	----	----	*	----
58. GEN. LINGULA.					
168. *Lingula subspatulata*, Hall and Meek	----	----	----	*	----
59. GEN. SERPULA.					
169. *Serpula? tenuicarinata*, Meek and Hayden	----	*	----	----	----
60. GEN. HEMIASTER.					
170. *Hemiaster? Humphreysianus*, Meek and Hayden	----	----	----	*	----
61. VERTEBRATA.					
171. *Mosagarus Missouriensis*, Leidy	----	----	----	*	----

There are still in the collection several undescribed species of *Mollusca*, also remains of fishes from Nos. 2, 3, and 4.

The great Lignite Tertiary basin differs from the Tertiary basin of White River, by its numerous beds of Lignite, more or less pure, and by the extent and beauty of its fossil flora. Some of the beds of Lignite

are seven feet in thickness, but they usually vary from two to four feet. The collection of fossil plants from this deposit is very fine, consisting of nearly fifty species, all of which are as yet undescribed, but are supposed to be new to science. Many of the leaves strongly resemble those of existing forest-trees, and seem to belong to the genera *Platanus*, *Acer*, *Ulmus*, *Alnus*, *Populus*, *Betula*, *Shulex*, &c. The *Molusca* consists of land and fresh water, with a few estuary shells. These have all been described, and drawings made. Five species of *Vertebrata* have been discovered in this deposit. The following species of organic remains have, up to this time, been described from this basin:

VERTEBRATA.

1. *Thespesius occidentalis*, Leidy.
2. *Ischyrotherium antiquum*, Leidy.
3. *Mylognathus priscus*, Leidy.
4. *Compsemys victus*, Leidy.
5. *Emys obscurus*, Leidy.

MOLLUSCA.

6. *Cyclas formosa*, Meek and Hayden.
7. *Cyclas fragilis*, Meek and Hayden.
8. *Cyclas subellipticus*, Meek and Hayden.
9. *Cyrena moreauensis*, Meek and Hayden.
10. *Cyrena intermedia*, Meek and Hayden.
11. *Corbula mactriformis*, Meek and Hayden.
12. *Unio priscus*, Meek and Hayden.
13. *Bulimus teres*, Meek and Hayden.
14. *Bulimus vermiculus*, Meek and Hayden.
15. *Bulimus limneaformis*, Meek and Hayden.
16. *Bulimus Nebrascensis*, Meek and Hayden.
17. *Pupa helicoides*, Meek and Hayden.
18. *Limnea tenuicosta*, Meek and Hayden.
19. *Physa longiuscula*, Meek and Hayden.
20. *Physa rhomboidea*, Meek and Hayden.
21. *Physa Nebrascensis*, Meek and Hayden.
22. *Planorbis subumbilicatus*, Meek and Hayden.
23. *Planorbis convolutus*, Meek and Hayden.
24. *Planorbis fragilis*, Meek and Hayden.
25. *Velletia* (*Ancylus*) *minuta*, Meek and Hayden.
26. *Paludina multi lineata*, Meek and Hayden.
27. *Paludina Leai*, Meek and Hayden.
28. *Paludina retusa*, Meek and Hayden.
29. *Paludina peculiaris*, Meek and Hayden.
30. *Paludina trochiformis*, Meek and Hayden.
31. *Paludina Leidyi*, Meek and Hayden.
32. *Valvata parvula*, Meek and Hayden.
33. *Melania minutula*, Meek and Hayden.
34. *Melania Anthonyi*, Meek and Hayden.
35. *Melania multistriata*, Meek and Hayden.
36. *Melania Nebrascensis*, Meek and Hayden.
37. *Melania Warrenana*, Meek and Hayden.
38. *Melania tenui carinata*, Meek and Hayden.
39. *Cerithium Nebrascensis*, Meek and Hayden.

The Tertiary basin of White and Niobrara rivers forms one of the most interesting and remarkable fresh-water deposits on our continent.

It differs, both lithologically and paleontologically, from the two basins previously alluded to. It contains no fossil plants, no lignite beds, and not one of the numerous species of organic remains which have been collected from it is identical or allied to species found in other portions of the Tertiary of the Northwest. Two distinct faunas are represented by the collections from this deposit—the fauna of the Miocene period from the region of White River and the fauna of the Pliocene period from the Niobrara. The latter fauna has enabled Dr. Leidy, the distinguished comparative anatomist, to arrive at some important conclusions. He says:

"The extinct fauna of the Niobrara is especially rich in remains of ruminating and equine animals. Among the former are several peculiar genera, of which two are closely allied to *Oreodon* and *Leptauchenia*, of the Miocene deposit of the Mauvaises Terres; one is allied to the musk-deer and another closely approaches the camel. Besides the remains of a true species of *Equus*, the collection contains those of two species of *Hipparion*, and several peculiar genera of the equine family. There are also remains of several species of canine and feline animals, of a small species of beaver, and of a species of porcupine more nearly allied to that of the Old World than to our own recent one. The collection further contains remains of a rhinoceros resembling those of India, those of a new species of mastodon, and those of a large elephant.

"One of the most remarkable circumstances in relation with this extinct fauna is, that it is more nearly allied to the present recent one of the Old World than to that of our own continent. From a comparison of our recent fauna and flora with that of the eastern continent, the deduction has been made that the western continent is the older of the two, geologically speaking, whereas the Niobrara fauna would indicate just the reverse relationship of age. A number of similar instances show that totally different fauna and flora may be cotemporaneous, and do not necessarily indicate different periods of existence."

Vertical section, showing the order of superposition of the different beds of the Tertiary basin of White and Niobrara Rivers.

		Subdivisions.	Localities.	Estimated thickness.
POST PLIOCENE.		Yellow siliceous marl, similar in its character to the Loess of the Rhine, passing down into variegated indurated clays and brown and yellow fine grits; contains remains of extinct quadrupeds, mingled with those identical with recent ones; also a few mollusca, mostly identical with recent species so far as determined.	Most fully developed along the Missouri River, from the mouth of the Niobrara to Saint Joseph; also in the Platte Valley and on the Loup Fork.	300 to 500 feet.

Vertical section, &c.—Continued.

	Subdivisions.		Localities.	Estimated thickness.
PLIOCENE TERTIARY.	Bed F.	1st. Dark-gray or brown sand, loose, incoherent, with remains of mastodon, elephant, &c. 2d. Sand and gravel, incoherent. 3d. Yellowish-white grit, with many calcareous, arenaceous concretions. 4th. Gray sand with a greenish tinge; contains the greater part of the organic remains. 5th. Deep yellowish-red arenaceous marl. 6th. Yellowish-gray grit, sometimes quite calcareous, with numerous layers of concretionary limestone, from two to six inches in thickness, containing freshwater and land shells, Succinea, Limnea, Paludina, Helix, &c., closely allied and perhaps identical with living species; also much wood of coniferous character.	Covers a very large area on Loup Fork, from the mouth of North Branch to source of Loup Fork; also in the Platte Valley. Most fully developed on the Niobrara River, extending from the mouth of Turtle River three hundred miles up the Niobrara; also on Bijoux Hills and Medicine Hills. Thinly represented in the valley of White River.	300 to 400 feet.
MIOCENE.	Bed E.	Usually a coarse-grained sandstone; sometimes heavy bedded and compact; sometimes loose and incoherent; varies much in different localities. Forms immense masses of conglomerate; also contains layers of tabular limestone, with indistinct organic remains; very few mammalian remains detected, and those in a fragmentary condition. Passes gradually into the bed below.	Most fully developed along the upper portion of Niobrara River and in the region around Fort Laramie. Seen also on White River and on Grindstone Hills.	180 to 200 feet.
	Bed D.	A dull reddish-brown indurated grit, with many layers of silico-calcareous concretions, sometimes forming a heavy-bedded fine-grained sandstone; contains comparatively few organic remains.	Niobrara and Platte Rivers; well developed in the region of Fort Laramie; also in the valley of White River. Conspicuous, and composing the main part of the dividing ridge between White and Niobrara rivers.	350 to 400 feet.
MIOCENE.	Bed C.	Very fine yellow calcareous sand, not differing very materially from Bed D, with numerous layers of concretions and rarely organic remains, passing down into a variegated bed, consisting of alternate layers of dark-brown clay and light-gray calcareous grit, forming bands, of which I counted twenty-seven at one locality, varying from one inch to two feet in thickness.	White River, Bear Creek, Ash Grove Spring, head of Shyenne River. Most conspicuous near White River.	50 to 80 feet.
	Turtle and Oreodon, Bed B.	A deep flesh-colored argillo-calcareous indurated grit. The outside, when weathered, has the appearance of a plastic clay. Passes down into a gray clay, with layers of sandstone, underlaid by a flesh-colored argillo-calcareous stratum, containing a profusion of mammalian and chelonian remains. Turtle and Oreodon Bed.	Old Woman's Creek, a fork of Shyenne River; also on the head of the South Fork of the Shyenne; most conspicuous on Sage and Bear Creeks, and at Ash Grove Spring. Well developed in numerous localities in the valley of White River.	80 to 100 feet.

Vertical section, &c.—Continued.

	Subdivisions.		Localities.	Estimated thickness.
MIOCENE.	Titanotherium, Bed A.	Light-gray fine sand, with more or less calcareous matter, passing down into an ash-colored plastic clay, with large quantities of quartz grains disseminated through it, sometimes forming aggregated masses like quartzose sandstone cemented with plastic clay; then an ash-colored clay, with a greenish tinge, underlaid at base by a light-gray and ferruginous siliceous sand and gravel, with pinkish bands. Immense quantities of silex, in the form of seams, all through the beds. Titanotherium Bed.	Old Woman's Creek; also in many localities along the valley of the South Fork of Shyenne. Best development on Sage and Bear Creeks. Seen at several localities in the valley of White River.	80 to 100 feet.
CRETACEOUS.	Nos. 4 and 5.	Cretaceous beds 5 and 4, with their usual lithological characters and fossils.	Exposed underneath the Tertiary Beds on the South Fork of Shyenne and its southern branches; also in White River Valley, near its source.	

Catalogue of all the fossils hitherto described, from the Tertiary formations of White and Niobrara Rivers, with a table showing their stratigraphical position.

	Beds in ascending order.					
	A.	B.	C.	D.	E.	F.
RUMINANTIA.						
1. *Oreodon gracilis*, Leidy	....	*	*	*	....	....
2. *Oreodon Culbertsoni*, Leidy	....	*	*	*	....	....
3. *Oreodon major*, Leidy	....	*	....	*	....	....
4. *Agriochœrus major*, Leidy	....	*	....	*	....	....
5. *Agriochœrus antiquus*, Leidy	....	*	....	*	....	....
6. *Poebrotherium Wilsoni*, Leidy	....	*	....	....	....	....
7. *Leptomeryx Evansi*, Leidy	....	*	....	*	....	....
8. *Leptauchenia decora*, Leidy	....	....	....	*	....	....
9. *Leptauchenia major*, Leidy	....	....	....	*	....	....
10. *Protomeryx Halli*, Leidy	....	....	....	*	....	....
11. *Merycodus necatus*, Leidy	....	....	....	....	....	*
12. *Megalomeryx niobrahensis*, Leidy	....	....	....	....	....	*
13. *Merychochœrus proprius*, Leidy	....	....	....	*	....	....
14. *Procamelus occidentalis*, Leidy	....	....	....	....	....	*
15. *Procamelus robustus*, Leidy	....	....	....	....	....	*
16. *Procamelus gracilis*, Leidy	....	....	....	....	....	*
17. *Merychyus elegans*, Leidy	....	....	....	....	....	*
18. *Merychyus medius*, Leidy	....	....	....	....	....	*
19. *Merychyus major*, Leidy	....	....	....	....	....	*
20. *Cervus Warreni*, Leidy	....	....	....	....	....	*

Catalogue of all the fossils hitherto described, &c.—Continued.

	Beds in ascending order.					
	A.	B.	C.	D.	E.	F.
MULTUNGULA.						
21. *Chœropotamus* (*Hyopotamus*) *americanus*, Leidy	*					
22. *Entelodon Mortoni*, Leidy		*		*		
23. *Entelodon ingens*, Leidy		*		*		
24. *Titanotherium Prouti*, Leidy	*					
26. *Paleochœrus probus*, Leidy		*		*		
27. *Leptochœrus spectabilis*, Leidy		*		*		
28. *Rhinoceros occidentalis*, Leidy		*	*	*	*	
29. *Rhinoceros* (*Hyracodon*) *nebrascensis*, Leidy		*	*	*	*	
30. *Rhinoceros crassus*, Leidy						*
31. *Mastodon* (*Tetralophodon*) *merificus*, Leidy						*
32. *Elephas* (*Euelephas*) *imperator*, Leidy						*
SOLIDUNGULA.						
33. *Hipparion*, *S. Hippotherium occidentale*, Leidy						*
34. *Hipparion*, *S. Hippotherium speciosum*, Leidy						*
35. *Anchitherium Bairdi*, Leidy		*				
36. *Anchitherium* (*Hypohippus*) *affinis*, Leidy				*		
37. *Anchitherium* (*Parahippus*) *cognatus*, Leidy				*		
38. *Merychippus insignis*, Leidy						*
39. *Merychippus mirabilis*, Leidy						*
40. *Equus excelsus*, Leidy						*
41. *Equus* (*Protohippus*) *perditus*, Leidy						*
RODENTIA.						
42. *Stenofiber nebrascensis*, Leidy			*	*		
43. *Ischyromys typus*, Leidy			*	*		
44. *Palœolagus Haydeni*, Leidy			*	*		
45. *Eumys elegans*, Leidy		*				
46. *Hystrix* (*Hystricops*) *venustus*, Leidy				*		*
47. *Castor* (*Eucastor*) *tortus*, Leidy						*
CARNIVORA.						
48. *Hyœnodon horridus*, Leidy		*				
49. *Hyœnodon cruentus*, Leidy		*				
50. *Hyœnodon crucians*, Leidy		*				
51. *Amphicyon vetus*, Leidy		*				
52. *Amphicyon gracilis*, Leidy		*				
53. *Leptarctus primus*, Leidy						*
54. *Deinictis felina*, Leidy		*				
55. *Machairodus primœvus*, Leidy		*				
56. *Felis* (*Pseudælurus*) *intrepidus*, Leidy						*
57. *Ælurodon ferox*, Leidy						*
58. *Canis sœvus*, Leidy						*
59. *Canis temerarius*, Leidy						*
60. *Canis vafer*, Leidy						*
61. *Canis* (*Epicyon*) *Haydeni*, Leidy						*
CHELONIA.						
62. *Testudo nebrascensis*, Leidy		*	*	*	*	
63. *Testudo* (*Stylemys*) *niobrahensis*, Leidy						*
MOLLUSCA.						
64. *Helix Leidyi*, Hall and Meek		*				

Catalogue of all the fossils hitherto described, &c.—Continued.

	Beds in ascending order.					
	A.	B.	C.	D.	E.	F.
MOLLUSCA—Continued.						
65. *Planorbis nebrascensis*, Evans and Shumard	....	....	....	*	....	....
66. *Lymnea diaphana*, Evans and Shumard	....	....	....	*	....	....
67. *Lymnea nebrascensis*, Evans and Shumard	....	....	....	*	....	....
68. *Physa secalina*, Evans and Shumard	....	....	....	*	....	....
CRUSTACEA.						
69. *Cypris Leidyi*, Evans and Shumard	....	....	....	*	....	....

MINERALS AND GEOLOGICAL SPECIMENS.

	I.—IGNEOUS AND METAMORPHIC ROCKS.	
1	Gneiss ferruginous	Twelve miles northwest of Fort Laramie.
2	Mica slate	Do.
3	Mica, more micaceous	Do.
4	Granite, coarse	Laramie Peak.
5	Mica slate, with silvery mica	Four miles north of Fort Laramie.
6	Granite, pulverulent	Raw Hide Butte.
7	Felspar, flesh-colored from No. 6	Do.
8	Granite, fine-grained, micaceous	Do.
9	Granite, gray	Laramie Hills.
10	Quartz, white	Do.
11	Hornblende slate	Do.
12	Hornblende rock	Do.
13	Mica slate	Do.
14	Hornblende rock in granite	Do.
15	Red felspar from 14	Do.
16	Crystalline quartz from 14	Do.
17	Flesh-colored felspar from 14	Do.
18	Mica slate, with garnets	Do.
19	....do	Do.
20	Mica, containing iron	Do.
21	Flesh-colored felspar in large crystals	Do.
22	Chlorite slate	Do.
23	Mica slate	Do.
24	Granite, coarse, over No. 23	Do.
25	Felspathic granite, pink	Do.
26	Quartz veins in 25	Do.
27	Hornblende rock, masses in granite	Do.
28	Granite, fine-grained	Do.
29	Hornblende rock	Do.
30	Hornblendic granite	Do.
31	Hornblende, with crystals of felspar	Do.
32	Mica slate, hornblendic	Do.
33	....do	Do.
34	Mica slate, with large plates of mica	Do.
35	Granite, white felspathic	Do.
36	Quartz, veins in 35	Do.
37	Siliceous limestone, Silurian or Devonian	Do.
38	Siliceous limestone, Silurian or Devonian, highly crystalline.	Do.
39	....do	Do.
39½	Syenite, pink, under 39	Do.

Minerals and geological specimens—Continued.

	I.—IGNEOUS AND METAPHORIC ROCKS—Con'd.	
40	Metamorphic siliceous limestone	Raw Hide Butte.
41	Metamorphic siliceous limestone, purplish	Do.
42	Quartz, in granite	Do.
43	Metamorphic limestone, gray	Do.
44	Mica slate	Do.
45	Micaceous granite	Do.
46	do	Do.
47	Mica slate, fine-grained	Do.
48	Metamorphic limestone, crystalline	Do.
49	Metamorphic limestone, purplish	Do.
50	Metamorphic limestone, similar to 48	Do.
51	Talcose slate	Do.
52	Felspathic granite, flesh-colored	Do.
53	Mica slate, with garnets	Do.
54	Mica slate, very fine grained	Do.
55	Talcose slate, dark	Do.
56	Talcose slate, light	Do.
57	Porphyritic trap	Black Hills.
58	Hornblende slate	Do.
59	Felspathic granite, pink	Do.
60	Plates of mica from 59	Do.
61	Quartz vein in chlorite slate	Do.
62	Chlorite slate	Do.
63	Trachyte	Do.
64	Quartz veins in 63	Do.
65	do	Do.
66	Chlorite slate	Raw Hide Butte, west side.
67	Hornblende rock, underlying Tertiary series	Do.
68	Schorl in quartz from clay slate	Black Hills.
69	do	Do.
70	Augite	Do.
71	Quartz, with felspar	Laramie Hills.
72	Porphyritic trap, columnar	Stone Butte, Black Hills.
73	do	Do.
74	do	Do.
75	Trachyte	Do.
76	Vesicular trap	Do.
77	Trachyte	Do.
78	Siliceous limestone	Raw Hide Butte.
79	Porphyritic trachyte	Stone Butte, Black Hills.
80	Compact trachyte, with scales of mica	Bear Peak, Black Hills.
81	do	Do.
82	Gray basaltic trap	Do.
83	Porphyritic trachyte	Do.
84	do	Do.
85	Quartzite	Do.
86	Gray trachyte	Do.
87	Metamorphic sandstone	Do.
	II.—SEDIMENTARY ROCKS.	
	Silurian and Devonian.	
89	Potsdam sandstone, red, with *Lingula antiqua*	Do.
90	Potsdam sandstone, gray, fine, with *Obolus*	Do.
91	Potsdam sandstone, porous, with *Trilobites*	Do.
92	Metamorphic, conglomerate over granite	Laramie Hills.
93	Metamorphic, with cherty pebbles	Do.
94	do	Do.
95	Argillaceous limestone, Devonian	Do.
96	Metamorphic conglomerate	Do.
	Carboniferous.	
97	Limestone, with Spirifer	Black Hills.

Minerals and geological specimens—Continued.

	II.—SEDIMENTARY ROCKS—Continued.	
	Carboniferous—Continued.	
98	Blue cherty limestone, with *Spirigera subtilita.*	Black Hills.
99	Blue cherty limestone, with corals	Do.
100	Blue cherty limestone, with *Spirifer lineatus*	Do.
101	*Rhynconella mormoni*	Do.
102	*Rhynconella mormoni*, with *Cyathophyllum*	Do.
103	*Rhynconella mormoni*, with *Zaphrentis*	Do.
104	*Rhynconella mormoni*, with *Syringapora*	Do.
105	*Rhynconella mormoni, Porites*	Do.
106	Yellowish cherty limestone, over 98, with *Spirifer rockymontana.*	Do.
107	Yellowish cherty limestone, over 98, with *Spirifer cameratus* and *lineatus.*	Do.
108	Cherty nodules in 98	Do.
109	Arogonite in 98	Do.
110	Coarse, granular limestone, with crinoidal columns.	Fort Laramie.
111	Blue compact limestone, *Productus* and *Terebratula subtilita.*	Do.
112	Blue compact limestone, corals	Do.
113	Blue compact limestone, with *Spirifer lineatus.*	Do.
114	Yellowish cherty limestone, with *Productus*	Warm Spring near Fort Laramie.
115	White limestone, with *Spirifer rockymontana*	Near Fort Laramie.
116	*Terebratula subtilita* from, 110	
117	*Panopæa*	Near Tecama, Nebraska.
118	*Allorisma*	Bellevue, Nebraska.
119	*Productus*	Do.
120	*Spirifer cameratus*	Do.
121	*Terebratula subtilita*	Do.
122	*Bellerophon*	Do.
123	*Chonetes*	Do.
124	*Chætetes*	Do.
	Permo-Carboniferous and Permian.	
125	Arenaceous limestone, foliated with *Bakevellia.*	Black Hills.
126	Red sandstone, soft, very fine grain, under 125.	Do.
127	Pink sandstone, over 126	Do.
128	Limestone, (125,) with *Orthoceratite*	Do.
129	Limestone, with *Bellerophon*	Do.
130	Limestone, with *Pleurotomania*	Do.
131	Limestone, with *Spirifer*	Do.
132	Limestone, with *Allorisma*	Big Blue, Kansas Territory.
133	Yellow magnesian limestone, with *Nautilus, Monotis, Bakevellia, Myalina.*	Smoky Hill Fork.
134	Yellow magnesian limestone, compact, with *Mytilus.*	Banks of Missouri, south line of Nebraska.
135	Magnesian limestone, with *Monotis*	Big Cottonwood.
136	Magnesian limestone, with *Avicula*	12 miles west of Big Blue.
137	Chertz rock, gray, with *Avicula* and *Myalina*	Black Hills.
138	Chertz rock, (Burch stone,) with crinoidal columns.	Do.
139	Sacarhoid gypsum, over 133	Smoky Hill Fork.
140	*Monotis*, from 136	Do.
141	Blue limestone, porous, with fenestella	Big Blue.
142	Cellular calcareous rock	Smoky Hill Fork.
143	Cellular calcareous rock, more compact	Do.
144	Cellular calcareous rock, with spherical cavities.	Do.
145	Cellular calcareous rock, more argillaceous	Near Cottonwood Creek.

Minerals and geological specimens—Continued.

	II.—SEDIMENTARY ROCKS—Continued.	
	Jurassic.	
146	Arenaceous limestone, light brown, with *Avicula tenuicostata.*	Black Hills.
147	Arenaceous limestone, bluish, over 146, with *Avicula.*	Do.
148	Ferruginous limestone, with *Cypricardia*	Do.
149	Ferruginous limestone, red, with *Avicula*	Do.
150	Yellow arenaceous limestone, with *Serpula*	Do.
151	Limestone bored, with lithophagous mollusks.	Do.
152	Red marl, overlying 141, containing snowy gypsum.	Do.
153	Snowy gypsum, from 152	Do.
154	Crystalline gypsum, from seams in 152	Do.
155	Fibrous gypsum, from seams in 152	Do.
156	Blue compact limestone, (fresh water,) in 158, containing *Unio nucalis* and *Planorbis.*	Do.
157	Arenaceous limestone, same as 150, containing *Pentacrinus*, with *Serpula* and *Ostrea* attached to surfaces.	Do. Do.
158	Yellowish argillo-arenaceous limestone, with *Ostrea*, Upper Jurassic.	Do.
159	Gray shell limestone, containing *Ammonites*, *Belemites*, &c., interstratified with 158.	Do.
160	Snowy gypsum, with no stains, equivalent of 153.	Big Horn River.
161	Gypsum, with crystals of selenite	
162	Snowy gypsum	Near sources of Yellowstone.
	CRETACEOUS.	
	Formation No. 1.	
163	Conglomerate and sandstone, with *Unios*	Bad-lands of Judith.
164	Conglomerate	Do.
165	Conglomerate, fine, with *Melanias* and *Cyclas.*	Do.
166	Gray arenaceous limestone, with *Melania* and *Helix.*	Do.
167	Conglomerate, same as 165	Do.
168	Arenaceous limestone, (166,) with leaves of *Credneria*, *Melanias*, &c.	Do.
169	Indurated ferruginous clay, with *Melanias*	Do.
170	Ferruginous sand, with *Unio danai*	Do.
171	Indurated clay, with *Melanias* and scales of *Lepidotus*, above 166.	Do.
172	Shell limestone containing *Melanias*	Do.
173	Impure sandy lignite, (stratum D of section).	Do.
174	Shell limestone, same as 172	Do.
175	Cream-colored shale, burnt, from over lignite beds.	Do.
176	Compact argillaceous limestone, with *Cytherea oweni*, (marine,) beneath fresh-water beds.	Do.
177	Ferruginous sandstone, with *Tellina subtortuosa.*	Do.
178	Rough gray limestone, with *Ostrea glabra*	Do.
179	Ferruginous sandstone, with *Inoceramus pectenuis*, upper marine strata.	Do.
180	Lignite, over 179	Do.
181	Carbonaceous sand from decomposition of lignite bed, over 179.	Rocky Mountain Creek.
182	Impure shaly lignite, with selenite	Near Ammel's Island.
183	Limestone, with *Cypris*, lower part of formation No. 1.	Black Hills, east base.
184	Silicified wood, ferruginous	Do.
185	Silicified wood, coniferous	Do.

Minerals and geological specimens—Continued.

	CRETACEOUS—Continued.	
	Formation No. 1—Continued.	
186	Bone of saurian	Black Hills, east base.
187	Bone of saurian or cetacian	Do.
188	Dense ferruginous sandstone	Black Hills, west base.
189	Quartzose sandstone, bluish	Do.
190		
191	Conglomerate from junction of Cretaceous and Carboniferous rocks.	Platte Valley.
192	Coarse ferruginous sandstone, with pebbles, over 199.	Do.
193	Dark ferruginous sandstone, over 192	Do.
194	Dark ferruginous sandstone containing much iron.	Do.
195	....do	Do.
196	Ferruginous sandstone	Blackbird Hill.
197	Ferruginous sandstone, fine-grained	Mouth of Elk Horn.
198	Dark coarse sandstone, very ferruginous	Do.
199	Red, ferruginous sandstone, with many species of dicotyledonous leaves.	Black Hills.
200	....do	
201	Light gray quartzose sandstone, with balls of sulphate of iron, over 199.	Black Hills.
202	Light gray quartzose sandstone, with dicotyledonous leaves.	Do.
203	Whitish pulverulent sandstone, over 199	Sioux City.
204	Whitish pulverulent sandstone, fine-grained, under 199.	Blackbird Hill.
205	Indurated clay, bluish	Do.
206	Indurated clay, yellow	Decatur.
207	Indurated clay, yellow	Do.
208	Ferruginous sandstone, with striated bivalves and *Cytherea arenaria.*	Big Sioux.
209	Indurated clay, with dicotyledonous leaves	Do.
210	Indurated sand, fine, yellow, with leaves of *Salix.*	Do.
211	Ferruginous sandstone	Mouth of Iowa Creek.
212	Ferruginous sandstone, fine-grained, with impressions of dicotyledonous leaves.	Mouth of Big Sioux.
213	Ferruginous sandstone, with *Solen dacotahensis.*	Do.
214	Lignite, under 209	Do.
215	Silicified wood, bored by *Teredo*	Big Sioux.
216	....do	Blackbird Hills.
217	....do	Smoky Hill Fork.
218	....do	Republican Fork.
219	Coarse ferruginous sandstone, with leaves of *Credneria.*	Smoky Hill.
220	Sandstone, very ferruginous	Do.
221	Cellular ferruginous rock	Do.
	Formation No. 2.	
222	Masses sulphuret iron, with sulphate	Mouth of Vermillion.
223	Crystallized sulphuret iron, with sulphate	Do.
224	Crystallized gypsum	Do.
225	....do	Do.
226	Crystallized gypsum, in plates	Do.
227	Large crystals selenite in black clay	Do.
228	....do....do....do	Do.
229	Ferruginous shale, with remains of fishes	Do.
230	Ferruginous shell limestone	Do.
231	Yellow clay, with gypsum	Do.
232	Conglomerate, with green siliceous pebbles	Do.
233	Conglomerate, with sharks' teeth	Do.

Minerals and geological specimens—Continued.

	CRETACEOUS—Continued.	
	Formation No. 2—Continued.	
234	Gray arenaceous limestone, with *Cytherea orbiculata.*	Mouth of Vermillion.
235	Gray arenaceous limestone, with fish-scales ..	Do.
236	Dark gray indurated clay, with fish-scales ...	Black Hills, east base.
237	Arenaceous limestone, (234,) with *Serpula*....	Dixon's Bluffs.
238	Conglomerate, with fish-teeth	Do.
239	Arenaceous limestone, gray, with *Inoceramus problematicus.*	Black Hills, west base.
	Formation No. 3.	
240	Soft yellow limestone, with *Inoceramus problematicus.*	Big Sioux.
241	Gray marl, with *Ostrea congesta,* and fish remains, (base of No. 3.)	Mouth James River.
242	.....do	Do.
243	Scale of *Cyclocladus,* in 242.....	Do.
244	Fibrous carbonate of lime, with *Ostrea congesta* attached to surface.	Durions Hills.
245	Yellow marl.....	Do.
246	.....do	Bijoux Hills.
247	Yellow marl, lighter	Do.
248	Crystalline carbonate of lime, seams, in marl.	Do.
249	Crystalline carbonate of lime, greenish, in marl.	Do.
250	Black plastic clay, upper part of No. 3.....	Near Bijoux Hills.
251	Shale, argillaceous, with fish remains, over 250	Do.
252	Shale, argillaceous, with fish remains, calcined by combustion, of 250.	Do.
	Formation No. 4.	
253	Blue clay, with *Ptychoceras mortoni*	Great Bend of Missouri.
254	Yellow clay, with crystals of gypsum.....	Do.
255	Whitish alum clay, seams, in 253	Bijoux Hills.
256	Hyd. silicate of magnesia, masses, in formation No. 4.	Do.
257	Crystals sulphate baryta	Do.
258	White aluminous earth, in seams.....	Do.
259	Aluminous clay, (255)	Do.
260	Ferruginous concretions, throughout formation No. 4.	Do.
261	Crystalline argillaceous limestone, (cone in cone.)	Shyenne River.
262	Crystals of selenite in clay beds	Fort Pierre.
263	Selenite and fibrous carbonate lime.....	Mouth Shyenne.
264	Yellow clay, with selenite	Twelve miles above Fort Pierre.
265	Dark argillaceous shale, with *Inoceramus*.....	Mouth of Cannon Ball River.
266	Blue concretionary limestone, with *Rostellaria*	Long Lake, Mo.
267	Indurated clay	Do.
268	Decomposed shale, (253)	Fort Pierre.
269	Brown hematite	Big Shyenne.
270	Brown hematite, more earthy	Do.
271	Dog-tooth spar.....	Mussel Shell River.
272	Gray arenaceous limestone.....	Milk River.
273	Gray arenaceous limestone, with carbonized matter and shells.	Cannon Ball River.
274	Soft argillaceous shale.....	Yellowstone River.
275	Concretions of compact blue limestone, containing great numbers of fossils.	Do.
276	Concretions of compact blue limestone, containing large crustacean, (undescribed.)	Do.

Minerals and geological specimens—Continued.

	CRETACEOUS—Continued.	
	Formation No. 4—Continued.	
277	Crystallized carbonate of lime, yellow, forming nucleus of concretions.	Forks of Shyenne.
278	Crystals of selenite	Do.
279	Blue indurated clay, with fibrous gypsum	Do.
280	Dove-colored laminated shale	Grand River.
281	Petrified wood bored by *Teredo bisinuata*	
282	"Cone in cone," (241)	Cannon Ball River.
283	Indurated clay, with shells	Grand River.
284	Soft micaceous sandstone, thin seam, in clay bed.	Fort Pierre.
285	Vertebra of *Mososaurus*	Do.
286	Wood bored by *Zylophaga stimpsoni*	Mussell Shell River.
287	White aluminous clay	Fort Lookout.
	Formation No. 5.	
288	Yellow arenaceous limestone, with *Venus*	Head of Little Missouri.
289	Yellow arenaceous limestone, softer	Do.
290	Yellowish calcareous sandstone, with *Cyprina*	Cannon Ball River.
291	Yellowish calcareous sandstone, decomposed.	Do.
292	Soft fine sandstone, with *Rostellaria*	Do.
293	Ferruginous sandstone, with *Cytherea*	Do.
294	Silicified wood, with bark	Long Lake.
295	Silicified wood, bored by *Teredo globosa*	Do.
	TERTIARY.	
	A.—Lignite basin.	
296	Yellow arenaceous clay on Cretaceous rocks.	
297	Yellowish indurated clay, with fresh-water shells, over 296.	Long Lake.
298	Gray sand, fine, over 297	Do.
299	Coarse gray calcareous sandstone, with fossils.	Top of Square Butte.
300	Soft argillo-calcareous shale, with fossil shells.	Thunder Butte.
301	Ferruginous shale, with coniferous plants	Do.
302	Dove-colored sandstone, with silicified wood.	Do.
303	Yellow indurated sand, with estuary shell of genus *Cyrena.*	Cherry Creek.
304	Light-colored indurated clay, base of section.	Fort Clark.
305	Dark carbonaceous clay, over 304	Do.
306	Lignite, over 305	Do.
307	Dark argillaceous shale, over 306	
308	Yellow indurated sand, with *Paludina* and *Melania.*	
309	Grayish indurated sand	
310	Dove-colored calcareous shale, with *Unios* and other fresh-water shells.	Red Spring.
311	Argillaceous limestone, with fossil plants	Fort Berthold.
312	Fine light-colored marl, under lignite bed	Do.
313	Lignite, bright and compact	Do.
314	Drab indurated clay	High Butte, Little Missouri.
315	Light-colored marl, with impressions of dicotyledonous leaves.	Fort Union.
316	Earthy lignite	Do.
317	Lignite	Yellowstone.
318	Lignite, more impure	Do.
319	Concretions sulphuret iron, common throughout Tertiary series.	Do.
320	*Septaria*, spherical	Fort Union.
321	Carbonaceous indurated clay, charged with vegetable remains, fresh-water and land shells, *Bulimus, Physa, Pupa,* &c.	Do.

Minerals and geological specimens—Continued.

	TERTIARY—Continued.	
	A.—Lignite basin—Continued.	
322	Mineralized wood	Fort Union.
323	Carbonized wood, from lignite bed	Do.
324	Light sandy marl	Do.
325	Shell marl, containing fresh-water shells	Do.
326	Impure lignite	Do.
327	Light-colored fine clay, under lignite bed	Do.
328	Brown shale, with vegetable impressions	Milk River.
329	Siliceous shale, containing much vegetable matter.	Do.
330	Gray shell limestone, soft	Do.
331	Carbonaceous clay, with *Unio, Paludina*, &c.	Yellowstone.
332	Coarse gray shell limestone	Elk Horn Prairie.
333	Compact bluish limestone, with fresh-water shells.	Red Spring.
334	Gray calcareous sandstone, with *Unio, Paludina*, &c.	Yellowstone.
335	Soft argillaceous limestone, with *Paludina rochiformis.*	Pardu River.
336	Crystallized carbonate of lime in concretions.	Fort Union.
337	Dove-colored argillaceous limestone, with impressions of ferns, over 315.	Do.
338	Brown calcareous shale, with *Taxites*	Yellowstone.
339	Silicified wood	Do.
340	Silicified wood, partially carbonized	Do.
341	....do	Do.
342	....do	Do.
343	....do	Do.
344	Silicified wood, with cavities lined with drusy quartz.	Fort Union.
345	Dove-colored clay, metamorphosed by burning out of lignite beds.	Mussel Shell River.
346	Brownish shale, metamorphosed by burning out of lignite beds.	Do.
347	Scoria, black, formed by burning out of lignite beds.	Yellowstone.
348	Scoria, yellowish, formed by burning out of lignite beds.	Do.
349	Scoria, black compact, formed by burning out lignite beds.	Do.
350	Scoria, green vitreous	Do.
351	Scoria, green vitreous, formed by burning out of lignite beds.	Do.
352	Scoria, red, very porous	Do.
353	Scoria, brown, very porous, formed by burning out of lignite beds.	Do.
354	Shale, burned, red, with vegetable impressions.	Do.
355	Shale, burned, bright red, with vegetable impressions.	Do.
356	Shale, burned, vermilion, with gypsum	Do.
356½	Shale, burned, black ferruginous	Do.
357	Calcareous pumice from burning of limestone.	Do.
	B.—White River Basin.	
	Bed A.	
358	Red sandy clay, containing pebbles, base of *Titanotherium* bed.	On Shyenne River.
359	Teeth of *Titanotherium prouti*	Old Woman's Fork.
360	Coarse whitish sandstone, above 358	Shyenne River.
361	Coarse whitish concretionary sandstone	Do.
362	Soft whitish calcareous sandstone, with scales of mica.	Do.

Minerals and geological specimens—Continued.

	TERTIARY—Continued.	
	B.—White River Basin—Continued.	
363	Greenish plastic clay	Shyenne River.
364	Greenish plastic clay, upper part	Sage Creek.
365	Plates of chalcedony	Bear Creek.
366	....do	Do.
367	....do	Do.
368	Fibrous carbonate lime	Do.
369	Dark chalcedony	Do.
370	Magnesite	Do.
371	Calcareous concretion, separating *Bed A* from *Bed B.*	Do.
	Bed B.	
372	Pinkish indurated marl	Do.
373	Whitish indurated marl, from over 372	Do.
374	Pinkish calcareous concretion	Do.
375	Decomposed marl, from 372 and 373	Do.
376	Decomposed marl, from 372 and 373, with *Oreodon.*	Do.
	Bed D.	
377	Cream-colored marl	White River.
378	Siliceous limestone, with fresh-water shells, *Planorbis, Limnea,* &c.	Do.
379	Tufaceous concretionary limestone	Do.
380	Cream-colored marl, containing *Oreodon*	Do.
	Bed E.	
381	Soft white grit	Do.
382	Conglomerate, above 381	Do.
383	Conglomerate, with granitic pebbles	Do.
384	Soft white sandstone, with *Oreodon*	Do.
385	Calcareous conglomerate	Fort Laramie.
386	Conglomerate	Bijoux Hills.
387	Calcareous concretions, in marl, under 386	Do.
388	Sulphate baryta, foliated crystals, in 387	Do.
389	Green siliceous concretions, in limestone, containing fresh-water shells.	Medicine Hills.
390	....do	Do.
391	Coarse whitish sandstone	Bad Land Creek.
392	Conglomerate	Grind Stone Hill.
393	Quartzose conglomerate	Do.
394	White infusorial earth, base of *Bed E*, local	Running Water.
395	....do	Loup Fork.
396		
397	Indurated marl, white	Warren's Fork.
398	Siliceous tufa	Niobrara River.
399	White marl	Loup Fork.
400	Whitish cherty limestone	Do.
401	White foliated limestone	Niobrara River.
402		
403	White tufaceous marl, containing fresh-water shells.	Loup Fork.
404	Silicified wood	Running Water.
405	....do	Do.
406	Siliceous sinter	Sage Creek.
407	Carbonate of lime	Bear Peak.
408	Ferruginous conglomerate	Yellowstone River.
409	Micaceous granite	Do.
410	Hornblendic rock	Do.
411	Limestone, with corals	Do.

Minerals and geological specimens—Continued.

	TERTIARY—Continued.	
	B.—White River Basin—Continued.	
412	Limestone, with *Spirifer*	Yellowstone River.
413	Limestone, with *Orthoceratite*	Do.
414	Limestone, with *Syringopora*	Do.
415	Chalcedony	Do.
416	Silicified wood	Do.
417	Limestone, with red chert	Do.
418	Concretions, from yellow marl	Big Sioux.
419	Siliceous sinter, from springs	Black Hills.
420	Sand, from sand-hills	Do.
421	Very fine gray sand, from sand dune	Powder River.
422	Prismatic iron-ore	Mouth Big Horn.
423	Efflorescence on soil	Cannon Ball River.

Dr. Newberry rendered me valuable assistance in making out the preceding catalogue.

MAMMALS.

The mammals of the collection have already been examined by Professor Baird, and most of the species determined. The collection contains skins, skeletons, and skulls of nearly all the larger mammals of the plains, with a large number of specimens of most of the smaller ones. I will here say a few words in regard to the present distribution of some of the larger animals on the Upper Missouri. Many of them are fast passing away, and in a few years must become extinct. The buffalo, which has been so important an agent in the preservation of the Indians, is now gradually gathering into a smaller area; and although in the valley of the Yellowstone and along the Upper Missouri thousands may yet be seen, they are annually decreasing at a rapid rate. In 1850, buffaloes were seen as low down on the Missouri as the Vermillion River, and in 1854 a few were killed near Fort Pierre, but at the present time none, except now and then a stray bull, are seen on the Missouri River below Fort Clark.* They are, however, quite abundant at this time on the Platte River and along the valley of the Smoky Hill Fork of the Kansas. Probably at this time all the larger animals, as buffalo, elk, deer, antelope, bighorn, and beaver, are more abundant in the valley of the Yellowstone than in any other portion of the Upper Missouri.

Descending the Yellowstone River in the summer of 1854, I saw, for the distance of 350 miles, the prairies on both sides of the river covered with herds of buffalo, and on the sand-bars large numbers of elk, deer, and antelopes. Elk and white-tailed deer (*Cervus leucurus*) are quite abundant even in the northern parts of Iowa, but the black-tailed deer (*Cervus macrotis*) is seldom seen below Fort Pierre. It is found chiefly in the most rugged portions of the country, in the region of the Black Hills, or in the vicinity of the mountains. The interminable ravines of Sage Creek and the Shyenne River are noted places for them. The antelope is seldom observed below Fort Pierre. It is, however, the most abundant animal in the Sioux country, and confined to the open prairies. The bighorn, or mountain sheep, (*Ovis*

* These animals occupy very different localities in different years and different seasons.—*Lieutenant Warren.*

montana,) is quite abundant in the almost inaccessible regions known as the Mauvaises Terres, or Bad Lands, but are not hunted much by the Indians for food. The beaver are increasing very rapidly, and many of the mountain streams literally swarm with them. Since the days of the trapper are over, and the price of their fur has become so reduced, the inducements to hunt them are not very great, and they are allowed to multiply undisturbed. Their flesh is eaten to some extent by the Indians and traders, and in the absence of other meat is considered quite a delicacy. The raccoon is seldom seen beyond the frontier. A few have been killed in the valley of White River, but they seldom pass up the Missouri above latitude 42°. The following is a list of the mammals contained in the collection and now deposited in the Smithsonian Institution:

1. *Sorex Haydeni*, Baird, (n. s.)—Hayden's Shrew.—Fort Pierre to Fort Union, Nebraska Range on the Missouri River, from latitude 44.20 to 48.00.—This small species of shrew is quite rare in Nebraska. It is seldom seen alive, though sometimes found dead along river banks. A single specimen was caught at Fort Pierre in the autumn of 1856, and a second one at Fort Union near the mouth of the Yellowstone. Three specimens were secured.

2. *Blarina brevicauda*, Gray.—Short-tailed Shrew.—Illinois to Nebraska.—A single specimen of this species was obtained near Fort Berthold, on the Missouri, in latitude , longitude ; very rare.

3. *Scalops argentatus*, Aud. & Bach.—Silvery Mole.—Detroit to Fort Riley, and south to Prairie Mer Rouge? Range in latitude from 42.20 to Louisiana? in longitude 83 to 97.—One specimen of this beautiful species was collected near the mouth of Big Sioux River. I do not think it occurs high up on the Missouri River.

4. *Lynx rufus*, Raf.—Wild Cat.—Atlantic to Pacific. Upper Missouri to the Gila River. Not on the Rio Grande?—The skins of this animal are very often brought to the different trading-posts on the Upper Missouri by the Indians, though seldom seen by the traveler. There is no portion of the country bordering on the Missouri River, or its tributaries, where it does not exist to a greater or less extent. The Canada Lynx (*Lynx canadensis*) has also been observed in several localities by the traders of the country.

5. *Canis occidentalis* var. *griseo-albus*.—White and Gray Wolf.—North America generally?—*Canis occidentalis* var. *nubilus*.—Dusky Wolf.—Missouri River to the Pacific.—This species, with its numerous varieties, is exceedingly abundant throughout the region of the Upper Missouri, above latitude 43°. It is most abundant where the buffalo range, and subsists mostly upon them. Their skins are made an article of trade, being valued at $1 apiece.

6. *Canis latrans*, Say.—Coyote; Prairie Wolf.—Fort Riley, Kansas, to the Pacific, and Upper Missouri to the Rio Grande of Texas.—This animal is much smaller, and the skins sell for only half the price of the *C. occidentalis*. It is exceedingly abundant throughout the Upper Missouri country, extending down into the settlements, where they often do much mischief to the farmers.

7. *Vulpes macrourus*, Baird.—Prairie Fox.—Upper Missouri to Plains of Columbia, O. T.—This is much the finest animal of the genus in this country. The skins are remarkable for the thickness and beauty of their fur. The different varieties, as Silver, Cross, and Black Fox, are well known among the traders, and are much valued. A skin of the Silver variety is a great prize, often selling for $100.

8. *Vulpes velox*, Aud. & Bach.—Kit Fox; Swift Fox.—Plains west of

Missouri to the Cascade Mountains of Oregon.—Like the Prairie or Barking Wolf, this animal is fond of wandering down among the settlements and committing his depredations upon the farmers. It is much hunted by the traders; but its skin is not very valuable, averaging only about 25 cents per skin. It is very abundant around prairie-dog villages, and subsists to a great extent upon the inhabitants.

9. *Putorius longicauda*, Rich.—Long-tailed Weasel.—Upper Missouri and Platte, (Carlton House, H. B. T., Rich.)—Not uncommon throughout the Northwest, though seldom seen by the traveler. Its skin is highly prized by the Indians, who use it for making articles of dress, tobacco pouches, and for other ornamental purposes.

10. *Lutra canadensis*, Sab.—American Otter.—Northern parts of the United States to Florida, and west to the Rocky Mountains. Not uncommon in the streams that flow from the north into the Missouri. I cannot ascertain that it has been seen above the mouth of the Niobrara River on the Missouri. The only specimen obtained by our party was taken in a beaver trap in the Niobrara, about eighty miles above its mouth. Otter skins are imported into the country every year by the traders, and are prized very highly by the Indians for ornamental purposes.

11. *Mephitis mephitica*.—Common Skunk.—United States, east of the Missouri plains and north of Texas.—Very common throughout the Upper Missouri country.

12. *Taxidea americana*, Waterh.—Missouri Badger.—Iowa and Wisconsin to the Pacific coast, and from Arkansas to 49° N. lat., (to 58° N. lat., Rich.)—This animal is not rare, though not very abundant on the Missouri. It seems to be of very little economical value, except for food to the starving Indian.

13 *Procyon lotor*, Storr.—Common Raccoon.—Massachusetts to Florida, and west to Fort Kearney. Not in Southern Texas?—Very abundant in the vicinity of Council Bluffs, where the skin is made a considerable article of trade with the Indians. It is not found high up on the Missouri. The highest point that I have observed it was near the mouth of the Niobrara River, though I have been informed that they are sometimes seen in the valley of White River.

14. *Ursus horribilis*, Ord.—Grizzly Bear.—Plains of Upper Missouri to the Rocky Mountains, and along their base, thence to the coast of California, (not of Oregon or Washington?)—This formidable animal is still quite abundant toward the sources of the Missouri. At the present time it is very seldom, if ever, seen below Fort Pierre. But one skin was taken by our party.

15. *Sciurus ludovicianus*, Custis.—Western Fox Squirrel.—Mississippi Valley.—Very abundant about Council Bluffs. Gradually becomes rare, and ceases near the mouth of White River.

16. *Sciurus carolinensis*, Gm.—Gray Squirrel; Black Squirrel.—Eastern United States to the Missouri River.—Two specimens of this squirrel were taken, one near Fort Leavenworth, and the other near the mouth of the Platte. It is seldom, if ever, seen above this point.

17. *Sciurus fremontii*, Towns.—Mountain Gray Squirrel.—A specimen obtained at Laramie Peak is supposed to belong to this point.

18. *Sciurus hudsonius*, Pallas.—Red Squirrel; Chickaree.—Labrador (lat. 56°) to Mississippi; and in the United States from the Atlantic to the Missouri River.—Several specimens supposed to be identical with this species were collected in the Black Hills, and is quite abundant in the oak woods of that region.

19. *Tamias quadrivittatus*, Rich.—Missouri Striped Squirrel.—Upper

Missouri to Rocky Mountains, and west to the Cascade range. Along the Rocky Mountains as far south as Fort Stanton, New Mexico. Lat. 33° 30′.—Very common in the "Bad Lands" and rocky portions of the Upper Missouri. Seldom, perhaps never, seen below Fort Pierre.

20. *Spermophilus franklini*, Rich.—Gray Gopher.—Northern Illinois and Wisconsin, and to Minnesota and Saskatchewan.—One specimen of the above species was taken near the mouth of the Loup Fork of the Platte. Quite rare.

21. *Spermophilus tridecem-lineatus*, Aud. & Bach.—Striped Gopher; Prairie Squirrel.—Eastern Michigan to the plains of the Missouri, and south to Red River, Arkansas, and Fort Thorn, N. M.—Very abundant on all the prairies of the Northwest.

22. *Sphermophilus Townsendii*, Bachman.—Townsend's Spermophile.—Rocky Mountains to the north.—Several specimens were collected near Fort Laramie.

23. *Cynomys ludovicianus*.—Prairie Dog.—Milk River and Upper Missouri; west toward the Rocky Mountains; south to Red River; southwest to the Upper Rio Grande, and a short distance into Sonoro?—Very abundant from the mouth of the Niobrara to the mountains; found in great numbers in the valley of the Yellowstone and along the Missouri above Fort Union.

24. *Arctomys flaviventer*, Bachman.—Yellow-footed Marmot.—Black Hills, Nebraska.—This animal is very rare, but one specimen having been secured on the Upper Missouri. The skins of only two individuals are in the museum of the Smithsonian Institution.

25. *Castor canadensis*, Kuhl.—American Beaver.—Throughout the entire area of North America.—The history of this animal is more interesting than that of any other on the Upper Missouri. In the palmy days of the trapper, the beaver became very scarce in the West; but since the price of their fur has become so low as to render the business of trapping them an unprofitable pursuit, they have multiplied to an enormous extent, so that all the little streams flowing from the mountains literally swarm with them. Their skins, however, are still a considerable article of trade.

26. *Geomys bursarius*, Rich.—Pouched or Pocket Gopher.—Missouri to Minnesota and Nebraska.—Very abundant on the rich bottoms around Council Bluffs and Big Sioux, where they do much mischief in the gardens. One specimen was taken near the mouth of Big Sioux, and a second on the Niobrara.

27. *Thomomys rufescens*, Maxim.—Fort Union Gopher.—Fort Pierre to Fort Union on the Missouri.—This gopher seems to take the place of the *Geomys bursarius* from Fort Pierre to the mountains. Two specimens were collected at Fort Union and one at Fort Randall on the Missouri.

28. *Jaculus hudsonius*.—Jumping Mouse.—Nova Scotia, (Labrador, Pennant,) to Southern Pennsylvania, and west to the Pacific Ocean.—Very rare. Only two specimens were obtained near Fort Union.

29. *Perognathus flavus*, Baird.—Upper Missouri, along eastern slopes of Rocky Mountains to Sonora and Chihuahua; and along the Rio Grande to Matamoras.—Collected on the Loup Fork during the summer of 1857.

30. *Dipodomys ordii*, Woodhouse.—Kangaroo Rat.—Platte River, along the eastern slope of the Rocky Mountains, into Durango and Coahuila, Mexico.—A single specimen was taken on the Niobrara River.

31. *Mus musculus*, Linn.—Common Mouse.—North America generally.

(Introduced.)—Abundant at all the fur-trading posts on the Missouri. *Mus rattus*, or Common Rat, is also introduced.

32. *Hesperomys sonoriensis*, LeConte.—Sonorian Mouse.—Upper Missouri and Rocky Mountains to El Paso and Sonora.—Very abundant near Fort Union and along the Yellowstone. Twenty-five specimens collected.

33. *Hesperomys leucogaster*.—Missouri Mouse.—Plains along the Upper Missouri.—Very rare; but two specimens secured; one near Bijoux Hills, the other on Vermillion prairie, and are the only specimens in the museum of the Smithsonian Institution.

34. *Neotoma cinerea*.—Rocky Mountain Rat.—Eastern slope of Northern Rocky Mountains and Upper Missouri.—Not rare, but seldom captured; usually found among the dry trees on the river-bottoms. The only specimen secured was taken at Fort Sarpy, near the mouth of the Big Horn River, on the Yellowstone.

35. *Arvicolo Haydeni*, Baird, (n. s.)—Fort Pierre, Nebraska.—But one specimen of this species has ever been detected.

36. *Lepus campestris*, Bach.—Prairie Hare.—Upper Missouri and Saskatchewan plains to the Cascade range of Oregon.—This hare, though not extremely abundant, is not uncommon in the Northwest, from the mouth of Niobrara River to the mountains. Four specimens were collected on the Yellowstone.

37. *Lepus sylvaticus*, Bach.—Gray Rabbit.—From Massachusetts throughout the United States as far as Indianola, Texas? and west to the Missouri as far as Fort Union, Nebraska.—Found all along the Missouri River to the mountains, but mostly confined to the wooded bottoms of the rivers and streams. Eight specimens are in the collection of the expedition.

38. *Lepus artemisia*, Bach.—Sage Hare.—Regions west of the Missouri to the Rocky Mountains, and to the Cascade Mountains of Oregon along the Columbia on the north, and to the city of Chihuahua on the south.—Abundant in the Bad Lands and on the sage plains of the Upper Missouri River. Five specimens were obtained by the expedition.

39. *Cervus canadensis*, Erxl.—American Elk.—Northern portions of United States to Upper Missouri, and west to the Pacific. Found in the Alleghenies of Pennsylvania and Virginia. (North to 57°, Rich.)—Most abundant in the valley of the Yellowstone and along the Missouri River above Fort Union. Not rare, though less abundant as low down the Missouri as Council Bluffs. The collection contains two pairs of skins, two of skeletons, with numerous separate skulls, and about twenty pairs of antlers.

40. *Cervus leucurus*, Douglass.—White-tailed Deer.—Upper Missouri and Platte to the Columbia River and Washington Territory. Western Texas and New Mexico?—Very abundant along the river-bottoms; most common from Council Bluffs to Fort Pierre. Four skins, with numerous separate skins and antlers, were obtained.

41. *Cervus macrotis*, Say.—Mule Deer.—Upper Missouri and Platte to the Cascade range, (head of Des Chutes River.) Oregon Territory. Not extending to the Pacific. Headwaters of Arkansas.—Much more abundant on the Upper Missouri than the *Cervus leucurus*. Four skins, two skeletons, and about thirty separate skulls and horns were collected.

42. *Antilocapra americana*, Ord.—Prong-horn Antelope; Cabree.—Plains west of Missouri, from the Lower Rio Grande to the Saskatchewan, and west to the Cascade and Coast range of the Pacific slope.—This beautiful and fleet animal is found everywhere on the open grassy plains,

from the mouth of the Niobrara River to the mountains. Our collection contains eight skins entire, one skeleton, and a large number of skulls.

43. *Ovis montana*, Cuvier.—Bighorn; Mountain Sheep.—Broken ground on the Upper Missouri and Platte. Rocky Mountains generally. As far west, at least, as Coast and Cascade Mountains of the Pacific slope.—Very abundant in the rugged and inaccessible portions of the Upper Missouri, especially the "Bad Lands."

44. *Bos americanus*, Gmelin.—American Buffalo.—Formerly found throughout nearly the whole of North America, east of the Rocky Mountains. Now confined to the plains west of the Missouri and along the slopes of the Rocky Mountains.

45. *Vespertilio pruinosus*, Say.—All over the United States east of the Rocky Mountains.

46. *Vespertilio noctivagans*, LeConte.—Common throughout the country east of the Rocky Mountains.

47. *Vespertilio novaboracensis*, Gmelin.

BIRDS.

	No. of specimens.
1.—*Cathartes aura*, (Linn.,) Illig. Turkey Buzzard. All of North America, except the arctic regions	1
2.—*Falco* (*Falco*) *anatum*, Bonaparte. Duck Hawk. North America, east of the Rocky Mountains	1
3.—*Falco* (*Hypotriorchis*) *columbarius*, Linn. Pigeon Hawk. Temperate North America, Mexico, Central America, Northern South America	2
4.—*Falco* (*Gennaia*) *polyagrus*, Cassin. Prairie Falcon. Western North America	3
5.—*Falco* (*Tinnunculus*) *sparverius*, Linn. Sparrow Hawk. Entire continent of America	5
6.—*Accipiter mexicanus*, Swains. Western North America	3
7.—*Buteo swainsoni*, Bonap. Swainson's Buzzard. Northern and Western North America	4
8.—*Buteo bairdii*, Hoy. Baird's Buzzard. Northern and Western North America	3
9.—*Buteo* (*Poecilopternis*) *borealis*, (Gmelin,) Vieill. Red-tailed Hawk. Eastern North America; fur countries; Cuba; Jamaica	3
10.—*Archibuteo ferrugineus*, (Licht.,) Gray. California Squirrel Hawk. Western North America	1
11.—*Circus hudsonius*, (Linn.,) Vieillot. Marsh Hawk. All of North America and Cuba	4
12.—*Bubo virginianus*, (Gmelin,) Bon. Great Horned Owl. The whole of North America. Runs into varieties, *atlanticus*, *pacificus*, *arcticus*, *magellanicus*	1
13.—*Otus wilsonianus*, Lesson. Long-eared Owl. The whole of Temperate North America	3
14.—*Brachyotus cassinii*, Brewer. Short-eared Owl. The whole of Temperate North America; Greenland; Cuba	2
15.—*Syrnium nebulosum*, (Forster,) Gray. Barred Owl. Eastern North America; Fort Tejon, Cal	1
16.—*Athene hypugæa*, Bonap. Burrowing Owl. From Mississippi River to the Rocky Mountains	7
17.—*Conurus carolinensis*, (Linn.,) Kuhl. Parakeet. Southern and Southwestern States, as far west as the Missouri	12

	No. of specimens.
18.—*Coccygus americanus*, (Linn.,) Bonap. Yellow-billed Cuckoo. Eastern United States to the Missouri plains	6
19.—*Coccygus erythrophthalmus*, (Wils.,) Bon. Black-billed Cuckoo. United States to the Missouri plains	6
20.—*Picus* (*Trichopicus*) *villosus*, Linn. Hairy Woodpecker. Northern and western regions; var. *major*, *medius*, *minor*	6
21.—*Picus* (*Trichopicus*) *pubescens*, Linn. Downy Woodpecker. Eastern United States, toward the eastern slope of the Rocky Mountains	3
22.—*Picoides dorsalis*, Baird. Striped Three-toed Woodpecker. Laramie Peak, Rocky Mountains	1
23.—*Sphyrapicus varius*, (Linn.,) Baird. Yellow-bellied Woodpecker. Atlantic Ocean to the eastern slopes of Rocky Mountains; Greenland	8
24.—*Sphyrapicus thyroideus*, (Cass.,) Baird. Brown-headed Woodpecker. Cascade and Coast range of California and Oregon	1
25.—*Centurus carolinus*, (Linn.,) Bon. Red-bellied Woodpecker. North America, from Atlantic coast to the eastern slope of the Rocky Mountains	3
26.—*Melanerpes erythrocephalus*, (Linn.,) Sw. Red-headed Woodpecker. North America, from the Atlantic to the eastern slope of the Rocky Mountains	9
27.—*Melanerpes torquatus*, (Wils.,) Bonap. Lewis' Woodpecker. Western America, from Black Hills to Pacific	6
28.—*Colaptes auratus*, (Linn.,) Sw. Flicker. Eastern North America to the eastern slopes of the Rocky Mountains; Greenland	8
29.—*Colaptes mexicanus*, Swain. Red-shafted Flicker. Western North America, from the Black Hills to Pacific	21
29ª.—*Colaptes hybridus*, Baird. Cross between two preceding. Upper Missouri	
30.—*Cheatura pelasgia*, Stephens. Chimney Swallow. Eastern United States to the slopes of the Rocky Mountains; Bijoux Hills, O. T	1
31.—*Antrostomus nuttalli*, (Aud.,) Cassin. Nuttall's Whip-poor-will. High central plains to the Pacific coast	2
32.—*Chordeiles popetue*, (Vieill.,) Baird. Night Hawk. North America generally	5
33.—*Ceryle* (*Megaceryle*) *alcyon*, (Linn.,) Boie. Belted Kingfisher. Entire continent of North America	2
34.—*Tyrannus carolinensis*, (Linn.,) Baird. Kingbird. Eastern North America to Rocky Mountains	9
35.—*Tyrannus verticalis*, Say. Arkansas Flycatcher. Western North America, from the high central plains to the Pacific	19
36.—*Sayornis fuscus*, (Gm.,) Baird. Pewee. Eastern North America	1
37.—*Sayornis sayus*, (Bon.,) Baird. Say's Flycatcher. Upper Missouri River and central high plains westward to the Pacific and south to Mexico	5
38.—*Contopus richardsonii*, (Sw.,) Baird. Short-legged Pewee. high central dry plains to the Pacific; Rio Grande valley southward to Mexico; Labrador	2

No. of specimens.

39.—*Empidonax minimus*, Baird. Least Flycatcher. Eastern United States to Fort Bridger 6

40.—*Turdus* (*Turdus*) *mustelinus*, Gm. Wood Thrush. Eastern United States to Missouri 1

41.—*Turdus* (*Turdus*) *fuscescens*, Stephens. Wilson's Thrush. Eastern North America to the Missouri; north to fur countries 1

42.—*Turdus* (*Turdus*) *swainsonii*, Cab. Olive-backed Thrush. Eastern North America to Fort Bridger; south to Mexico and Peru; north to Greenland; accidental in Europe and Siberia 3

43.—*Turdus* (*Turdus*) *aliciæ*, Baird. Gray-cheeked Thrush. Mississippi region to the Missouri 4

44.—*Turdus* (*Planesticus*) *migratorius*, Linn. Robin. Continent of North America to Mexico 3

45.—*Sialia sialis*, (Linn.,) Baird. Bluebird. Eastern North America to west of Missouri; Fort Laramie 9

46.—*Sialia arctica*, Sw. Rocky Mountain Bluebird. Upper Missouri to Rocky Mountain range, and south to Mexico; rare on the coast of California 9

47.—*Regulus calendula*, (Linn.,) Licht. Ruby-crowned Wren. United States, from Atlantic to Pacific 4

48.—*Anthus ludovicianus*, (Gm.,) Licht. Titlark. North America generally; Greenland; accidental in Europe 1

49.—*Mniotilta varia*, (Linn.,) Vieill. Black and White Creeper. Eastern North America to Missouri River; south to Guatemala. Var. *longirostris*, Baird. Florida 6

50.—*Parula americana*, (Linn.,) Bonap. Blue Yellow-backed Warbler. Eastern North America to Missouri River; south to Guatemala 1

51.—*Geothlypis trichas*, (Linn.,) Cab. Maryland Yellow throat. North America, from Atlantic to Pacific 7

52.—*Icteria longicauda*, (Lawr.) Long-tailed Chat. High central plains of United States to the Pacific; south into Mexico 12

53.—*Helminthophaga celata*, (Say,) Baird. Orange-crowned Warbler. Mississippi River to the Pacific; south to Northern Mexico 2

54.—*Seiurus aurocapillus*, (Linn.,) Sw. Golden-crowned Thrush. Eastern North America to the Missouri 8

55.—*Seiurus noveboracensis*, (Gm.,) Nutt. Water Thrush. Eastern United States to the Missouri, and south to Guatemala, perhaps to Brazil 2

56.—*Dendroica coronata*, (Linn.,) Gray. Yellow Rump. Eastern North America to the Missouri plains; stragglers seen on Puget's Sound 5

57.—*Dendroica audibonii*, (Towns.,) Baird. Audubon's Warbler. Pacific coast of United States to Rocky Mountains; south to Mexico 1

58.—*Dendroica pennsylvanica*, (Linn.,) Baird. Chestnut-sided Warbler. Eastern United States to the Missouri 1

59.—*Dendroica striata*, (Forster,) Baird. Black Poll Warbler. Eastern North America to the Missouri high plains; Cuba; Greenland 7

No. of specimens.

60.—*Dendroica æstiva*, (Gm..) Baird. Yellow Warbler. United States, from Atlantic to Pacific; south to Guatemala and West Indies 15

61.—*Dendroica maculosa*, (Gm.,) Baird. Black and Yellow Warbler. Eastern United States to the Missouri; south to Guatemala 1

62.—*Setophaga ruticilla*, (Linn.,) Sw. Redstart. Eastern United States to Fort Bridger; West Indies in winter 7

63.—*Pyranga ludoviciana*, (Wils.,) Bon. Louisiana Tanager. From the Black Hills to the Pacific; south to Mexico .. 2

64.—*Hirundo horreorum*, Barton. Barn Swallow. North America, from Atlantic to Pacific 3

65.—*Hirundo lunifrons*, Say. Cliff Swallow. North America, from Atlantic to Pacific 4

66.—*Cotyle riparia*, (Linn.,) Boie. Bank Swallow. North America generally 2

67.—*Progne purpurea*, (Linn.,) Boie. Purple Martin. North America generally 13

68.—*Ampelis cedrorum*, (Vieill.,) Baird. Cedar Bird. North America generally; south to Guatemala 2

69.—*Myiadestes townsendii*, (Aud.,) Cab. Townsend's Flycatcher. United States, from Rocky Mountains and Black Hills to the Pacific; south to the borders of Mexico 1

70.—*Collyrio borealis*, (Bon.,) Baird. Great Northern Shrike. Northern regions, from Atlantic to Pacific; in winter south, through most of the United States 1

71.—*Collyrio excubitoroides*, (Sw.,) Baird. White-rumped Shrike. Missouri plains and fur countries to Pacific coast; eastward into Wisconsin, Illinois, and Michigan (?) 6

72.—*Vireo gilvus*, (Vieill.,) Bon. Warbling Flycatcher. Atlantic to Pacific coast of the United States; var. *swainsonii*, Columbia River 6

73.—*Vireo* (*Lanivireo*) *solitarius*, (Wils.,) Vieill. Blue-headed Flycatcher. United States, from Atlantic to the Pacific 2

74.—*Mimus carolinensis*, (Linn.,) Gray. Catbird. Eastern United States to Fort Bridger 3

75.—*Oreoscoptes montanus*, (Towns.,) Baird. Mountain Mockingbird. Rocky Mountains, from Fort Bridger south to Mexico; along valley of Gila and Colorado; San Diego, California 1

76.—*Harporhynchus rufus*, (Linn.,) Cab. Brown Thrush. Eastern North America to Missouri River, and perhaps to high central plains, unless replaced by a long-tailed variety, (*H. longicauda*) 6

77.—*Salpinctes obsoletus*, (Say,) Cab. Rock Wren. High central plains, through the Rocky Mountains to the Cascade range, (but not on the Pacific coast?) Fort Tejon. 6

78.—*Cistothorus* (*Telmatodytes*) *palustris*, (Wils.,) Cab. Long-billed Marsh Wren. North America, from Atlantic to Pacific; north to Greenland 2

79.—*Cistothorus* (*Cistothorus*) *stellaris*, (Licht.,) Cab. Short-billed Marsh Wren. Eastern United States to the Loup Fork of Platte 1

80.—*Troglodytes ædon*, Vieill. House Wren. Eastern United States to the Missouri, or to the high central plains..... 1

No. of specimens.

81.—*Troglodytes parkmanni*, Aud. Parkman's Wren. Western America, from the high central plains and Upper Missouri to the Pacific 13

82.—*Sitta canadensis*, Linn. Red-bellied Nuthatch. North America to the Rocky Mountains, probably also to the Pacific 3

83.—*Polioptila cærulea*, (Linn.,) Sclat. Blue-gray Flycatcher. United States, from Atlantic to Missouri, and on the southern border from the Gulf of Mexico to the Coast mountains of California, south to Guatemala 1

84.—*Lophophanes bicolor*, (Linn.,) Bon. Tufted Titmouse. Eastern North America to the Missouri River, or else replaced there by a *L. missuriensis* 1

85.—*Parus septentrionalis*, Harris. Long-tailed Chickadee. Missouri River to the Rocky Mountains, or else replaced there by *P. albescens* 4

86.—*Eremophila cornuta*, (Wils.,) Boie. Sky Lark. Everywhere on the prairies and desert plains of North America; Atlantic States in winter. A smaller variety on the western plains 12

87.—*Carpodacus purpureus*, (Gm.,) Gray. Purple Finch. North America, from Atlantic to the high central plains 1

88.—*Chrysomitris tristis*, (Linn.,) Bon. Yellow Bird. North America generally 5

89.—*Chrysomitris pinus*, (Wils.,) Bon. Pine Finch. North America, from Atlantic to Pacific 2

90.—*Curvirostra americana*, (Wils.) Red Crossbill. North America generally, coming southward in winter. Resident in the mountains of Pennsylvania. Perhaps var. *mexicana* in Rocky Mountains 2

91.—*Curvirostra leucoptera*, (Gm.,) Wils. White-winged Crossbill. Northern parts of North America generally 2

92.—*Plectrophanes* (*Centrophanes*) *ornatus*, Towns. Chestnut-collared Bunting. Plains of the Upper Missouri 5

93.—*Plectrophanes* (*Centrophanes*) *melanomus*, Baird. Eastern slope of the Rocky Mountains; Mexico, on the table-lands 3

94.—*Plectrophanes* (*Rhynchophanes*) *maccownii*, Lawr. Eastern slopes of Rocky Mountains; from Fort Thorn, N. M., as far east as the Black Hills, north of the Platte 3

95.—*Passerculus savanna*, (Wils.,) Bon. Savannah Sparrow. Eastern North America to the Missouri plains 5

96.—*Poœcetes gramineus*, (Gm.,) Baird. Grass Finch. United States, from the Atlantic to the Pacific; or else one species to the high central plains, and another from this to the Pacific 10

97.—*Coturniculus passerinus*, (Wils.,) Bon. Yellow-winged Sparrow. Eastern United States to the high central plains, (Loup Fork;) also along the valley of Gila and Colorado 12

98.—*Coturniculus henslowi*, (Aud.,) Bon. Henslow's Bunting. Eastern United States as far north as Washington; westward to the Loup Fork of Platte 1

99.—*Chondestes grammaca*, (Say,) Bon. Lark Finch. From Wisconsin and the prairies of Michigan to Pacific coast; south to Texas and Mexico on the plains 19

	No. of specimens.
100.—*Zonotrichia leucophrys*, (Forster,) Sw. White-crowned Sparrow. United States, from Atlantic to the Rocky Mountains, where they become mixed up with *Z. gambelii*; Greenland	3
101.—*Zonotrichia gambelii*, (Nutt.,) Gambel. Rocky Mountains to the Pacific coast; Fort Bridger	2
102.—*Zonotrichia querula*, (Nutt.,) Gamb. Harris' Finch. Missouri River, above Fort Leavenworth	2
103.—*Zonotrichia albicollis*, (Gm.,) Bon. White-throated Sparrow. Eastern United States to the Missouri	13
104.—*Junco oregonus*, (Towns.,) Sclat. Oregon Snowbird. Pacific coast of the United States to the eastern side of the Rocky Mountains; stragglers as far east as Fort Leavenworth in winter, and Great Bend of Missouri	2
105.—*Junco caniceps*, (Woodh.,) Baird. Rocky Mountains, from Black Hills to Fort Bridger and San Francisco; mountains of New Mexico	2
106.—*Junco hyemalis*, (Linn.,) Sclat. Snowbird. Eastern United States to the Missouri, and as far west as Black Hills	3
107.—*Spizella monticola*, (Gm.,) Baird. Tree Sparrow. Eastern North America to the Missouri; also on Pole Creek and Little Colorado River, New Mexico	2
108.—*Spizella pusilla*, (Wils.,) Bon. Field Sparrow. Eastern North America to the Missouri River	5
109.—*Spizella socialis*, (Wils.,) Bon. Chipping Sparrow. North America, from Atlantic to Pacific	2
110.—*Spizella pallida*, (Sw.,) Bon. Clay-colored Bunting. Upper Missouri River and high central plains to the Saskatchewan country	5
111.—*Melospiza (Melospiza) melodia*, (Wils.,) Baird. Song Sparrow. Eastern United States to the high central plains	2
112.—*Melospiza (Helospiza) lincolnii*, (Aud.,) Baird. Lincoln's Finch. United States, from Atlantic to Pacific, and south through Mexico to Guatemala	
113.—*Melospiza (Helospiza) palustris*, (Wils.,) Baird. Swamp Sparrow. Eastern United States, from the Atlantic to the Missouri	1
114.—*Calamospiza bicolor*, (Towns.,) Bon. Lark Bunting. High Central Plains to the Rocky Mountains; southwesterly to valley of Mimbres and Sonora	5
115.—*Euspiza americana*, (Gm.,) Bon. Black-throated Bunting. United States, from the Atlantic to the border of the high central plains	17
116.—*Guiraca (Goniaphea) ludoviciana*, (Linn.,) Sw. Rose-breasted Grosbeak. Eastern United States to the Missouri plains; south to Guatemala	4
117.—*Guiraca (Goniaphea) melanocephala*, Sw. Black-headed Grosbeak. High central plains, from Yellowstone to the Pacific; table lands of Mexico	5
118.—*Guiraca cærulea*, (Linn.,) Sw. Blue Grosbeak. More Southern United States, from Atlantic to Pacific; south to Mexico	3
119.—*Cyanospiza amœna*, (Say,) Baird. Lazuli Finch. High central plains, to the Pacific	6

No. of specimens.

120.—*Cardinalis virginianus*, Bonaparte. Red Bird. More southern portions of the United States to the Missouri; probably along valley of Rio Grande to Rocky Mountains.. 1

121.—*Pipilo erythrophthalmus*, (Linn.,) Vieill. Ground Robin. Eastern United States to the Missouri River..... 9

122.—*Pipilo arcticus*, Sw. High central plains of Upper Missouri, Yellowstone, and Platte; Fort Bridger..... 15

123.—*Pipilo chlorurus*, (Towns.,) Baird. Blanding's Finch. Valley of Rio Grande and Gila. Rocky Mountains north to the South Pass; south of Mexico..... 3

124.—*Dolichonyx oryzivorus*, (Linn.,) Sw. Boblink. Eastern United States to Fort Bridger, Utah..... 3

125.—*Molothrus pecoris*, (Gm.,) Sw. Cow Bird. United States, from the Atlantic to California; Fort Bridger..... 7

126.—*Agelaius phœniceus*, (Linn.,) Vieill. Swamp Blackbird. United States, from Atlantic to Pacific..... 9

127.—*Xanthocephalus icterocephalus*, (Bon.,) Baird. Yellow-headed Blackbird. Western America, from Texas, Illinois, Wisconsin, and North Red River to California; south into Mexico; Greenland..... 2

128.—*Sturnella magna*, (Linn.,) Sw. Meadow Lark. Eastern United States to the high central plains; south to Mexico; Cuba?..... 3

129.—*Sturnella neglecta*, Aud. Western Lark. Western America, from high central plains to the Pacific; east to Pembina, and perhaps to Wisconsin..... 22

130.—*Icterus spurius*, (Linn.,) Bon. Orchard Oriole. United States, from the Atlantic to the high central plains; probably throughout Texas; south to Guatemala... . 12

131.—*Icterus Baltimore*, (Linn.,) Daudin. Baltimore Oriole. From Atlantic coast to the high central plains, and in their borders; south to Guatemala..... 9

132.—*Icterus Bullockii*, (Sw.,) Bon. Bullock's Oriole. High central plains to the Pacific; rare on Upper Missouri; south into Mexico..... 1

133.—*Scolecophagus ferrugineus*, (Gm.,) Sw. Rusty Blackbird. From Atlantic coast to the Missouri..... 1

134.—*Scolecophagus cyanocephalus*, (Wagl.,) Cab. Brewer's Blackbird. High central plains to the Pacific; south to Mexico; Pembina; Minnesota..... 5

135.—*Quiscalus versicolor*, (Linn.,) Vieill. Crow Blackbird. Atlantic to high central plains; Fort Bridger..... 7

136.—*Corvus carnivorus*, Bartram. American Raven. Entire continent of North America; rare east of the Mississippi..... 4

137.—*Corvus americanus*, Aud. Common Crow. North America to the Missouri region; also on the coast of California? (Not found on the high central plains?)..... 5

138.—*Picicorvus columbianus*, (Wils.,) Bon. Clark's Crow. From Rocky Mountains to Pacific; east to Fort Kearney.... 6

139.—*Pica hudsonica*, (Sabine,) Bon. Magpie. Arctic regions of North America; the United States, from the high central plains to the Pacific, north of California..... 15

140.—*Cyanura macrolophus*, Baird. Long-crested Jay. Central line of Rocky Mountains to the table-lands of Mexico.. 2

	No. of specimens.
141.—*Perisoreus canadensis*, (Linn.,) Bon. Canada Jay. Northern America into the northern parts of the United States, from Atlantic to Pacific; farther south in Rocky Mountains	9
142.—*Ectopistes migratoria*, (Linn.,) Sw. Wild Pigeon. North America to high central plains	3
143.—*Zenaidura carolinensis*, (Linn.,) Bon. Common Dove. Throughout United States, from Atlantic to Pacific; Cuba	1
144.—*Tetrao obscurus*, Say. Dusky Grouse. Black Hills of Nebraska to Cascade Mountains of Oregon and Washington	6
145.—*Centrocercus urophasianus*, (Bon.,) Sw. Cock of the Plains. Sage plains of the Northwest	4
146.—*Pediœcetes phasianellus*, (Linn.,) Baird. Sharp-tailed Grouse. Northern prairies and plains, from Wisconsin to Cascades of Oregon and Washington	5
147.—*Cupidonia cupido*, (Linn.,) Baird. Prairie Hen. Western prairies and plains, within the limits of the United States, east of the Rocky Mountains; southeast to Calcasieu, Louisiana; east to Pocono Mountains; Pennsylvania, Long Island, and eastern coast	3
148.—*Ortyx virginianus*, (Linn.,) Bon. Partridge; Quail. Eastern United States to the high central plains	1
149.—*Grus americanus*, (Linn.,) Ord. Whooping Crane. Florida and Texas; stragglers in Mississippi valley	1
150.—*Ardea herodias*, Linn. Great Blue Heron. Throughout the entire territory of the United States; West Indies	1
151.—*Botaurus lentiginosus*, Steph. Bittern. Entire continent of North America	2
152.—*Chanadrius vociferus*, (Linn.,) Cassin. Killdeer. North America to the arctic regions; Mexico; South America	5
153.—*Ægialitis* (*Oxychus*) *vociferus*, (Linn.,) Cassin. Killdeer. North America to the arctic regions; Mexico; South America	4
154.—*Ægialitis* (*Oxyechus*) *montanus*, (Towns.,) Cassin. Mountain Plover. Western North America; Fort Bridger and Fort Tejon	5
155.—*Ægialitis* (*Ægialeus*) *melodus*, (Ord.,) Cab. Piping Plover. Eastern coast of North America; Nebraska; Louisiana.	5
156.—*Recurvirostra americana*, Gm. American Avoset. All of Temperate North America; Florida	2
157.—*Phalaropus wilsonii*, Sab. Wilson's Phalarope. Entire Temperate regions of North America; New Mexico	7
158.—*Philohela minor*, (Gm.,) Gray. American Woodcock. Eastern North America	1
159.—*Gallinago wilsonii*, (Temm.,) Bon. English Snipe. Entire temperate regions of North America; California	4
160.—*Tringa* (*Actodromas*) *wilsonii*, Nuttall. Least Sandpiper. Entire Temperate North America	1
161.—*Tringa* (*Actodromas*) *bonapartii*, Schlegel. North America, east of the Rocky Mountains	2
162.—*Ereunetes petrificatus*, Ill. Semi-palmated Sandpiper. Entire temperate regions of North America; South America; varying much in size	4

No. of specimens.

163.—*Gambetta melanoleuca*, (Gm.,) Bon. Tell-tale; Stone Snipe. Entire temperate regions of North America. Mexico 2

164.—*Rhyacophilus solitarius*, (Wils.,) Bon. Solitary Sandpiper. Entire temperate regions of North America. Mexico.. 6

165.—*Tringoides macularius*, (Linn.,) Gray. Spotted Sandpiper. Entire Temperate North America; Oregon. Accidental in Europe 3

166.—*Actiturus bartramius*, (Wils.,) Bon. Field Plover. Eastern North America; South America. Europe 8

167.—*Limosa fedoa*, (Linn.,) Ord. Entire temperate regions of North America. South America 2

168.—*Numenius (Phæopus) borealis*, (Forst.,) Latham. Esquimaux Curlew. Eastern and Northern North America 3

169.—*Porzana (Porzana) carolina*, Vieill. Common Rail. Entire temperate regions of North America 1

170.—*Fulica americana*, Gmelin. Coot. Entire temperate regions of North America 2

171.—*Cygnus buccinator*, Rich. Trumpeter Swan. Western America, from the Mississippi Valley to the Pacific.... 1

172.—*Bernicla (Leucoblepharon) canadensis*, (Linn.,) Boie. Canada Goose. Whole of North America. Accidental in Europe 1

173.—*Anas boschas*, (Linn.,) Mallard. Entire continent of North America and greater part of Old World 1

174.—*Dafila acuta*, (Linn.,) Jenyns. Sprig-tail; Pin-tail. Whole of North America and Europe 1

175.—*Nettion crecca*, (Linn.,) Kaup. English Teal. Europe; accidental on the eastern coast of the United States.... 2

176.—*Querquedula discors*, (Linn.,) Steph. Blue-winged Teel. Eastern North America to Rocky Mountains. Not yet found on the Pacific coast nor in Europe 3

177.—*Apatula clypeata*, (Linn.,) Boie. Shoveler. Continent of North America; abundant in Europe 1

178.—*Mareca americana*, (Gm.,) Stephens. Baldpate; American Widgeon. Continent of North America; accidental in Europe 5

179.—*Aix sponsa*, (Linn.,) Boie. Summer Duck. Continent of North America 2

180.—*Erismatura rubida*, (Wils.,) Bon. Ruddy Duck. Whole of North America; abundant throughout the interior.... 1

181.—*Mergus americanus*, Cass. Sheldrake. Whole of North America 1

182.—*Lophodytes cucullatus*, (Linn.,) Reich. Hooded Merganser. Whole of North America 1

183.—*Larus delawarensis*, Ord. The Ring-billed Gull. Arctic America, Texas to Labrador, western rivers, northwest coast 3

184.—*Sterna frenata*, Gambel. The Least Tern. Texas to Labrador; western rivers 1

185.—*Hydrochelidon plumbea*, (Wils.) The Short-tailed Tern. Texas to the New England States; Mississippi River and tributaries; fur countries 2

186.—*Podiceps californicus*, Heermann. California Grebe. Western North America .....

FISHES.

A series of the principal fishes inhabiting the Missouri and its tributaries were collected and preserved in alcohol, and are now deposited in the museum of the Smithsonian Institution. A portion are still undescribed, and of those already determined, Dr. Girad has very kindly furnished me the following list:

1. *Stizostedion boreus*, Grd. Fort Union, Mo.
2. *Gasterosteus inconstans*, Kirtl. Yellowstone River.
3. *Amblodon grunnicus*, Rafin. Milk River.
4. *Pimelodus olivaceus*, Grd. Yellowstone River.
5. *Noturus flavus*, Rafin. Yellowstone River.
6. *Carpiodes damalis*, Grd. Fort Pierre.
7. *Ptychostomus Haydeni*, Grd. Yellowstone River.
8. *Acomus griseus*, Grd. Platte River.
9. *Acomus lacturius*, Grd. Milk River.
10. *Catostomus Sucklii*, Grd. Milk River.
11. *Pimephales fasciatus*, Grd. Milk River.
12. *Hybognathus argyritis*, Grd. Milk River.
13. *Hybognathus Eransi*, Grd. Fort Pierre.
14. *Argyreus dulcis*, Grd. Sweetwater.
15. *Pogonichthys communis*, Grd. Milk River.
16. *Gobio gelidus*, Grd. Milk River.
17. *Leucosomus dissimilis*, Grd. Milk River.
18. *Leucosomus macrocephalus*, Grd. Fort Pierre.
19. *Nocornis nebrascensis*, Grd. Sweetwater.
20. *Semotilus speciosus*, Grd. Platte River.
21. *Plargyrus boucmani*, Grd. Sweetwater.
22. *Hyodon tergisus*, Lesu. Fort Sarpy, Yellowstone.
23. *Scaphirhynchus platyrhynchus*, Baird. Upper Missouri.
24. *Polyodon folium*, Lacep. Fort Pierre.

REPTILES.

A large collection of reptiles was made from all parts of the Upper Missouri, and it is probable that the following list represents quite fully that portion of the Nebraska fauna. The species have been identified by Professor Baird and Mr. R. Kennicott, and the specimens are deposited in the museum of the Smithsonian Institution.

1. *Trionyx.* Yellowstone River.
2. *Emys elegans.* Yellowstone River.
3. *Emys.* Mouth Powder River.
4. *Cistudo.* Mouth Powder River.
5. *Crotalus confluentus*, Say. Yellowstone River.
6. *Crotalophorus tergeminus*, Holb. Yellowstone River.
7. *Entainia sirtalis* var. *parietalis*, B. & G. Loup Fork.
8. *Entainia.* Sand hills.
9. *Nerodia sipedon*, B. & G. Yellowstone River.
10. *Heterodon nasicus*, B. & G. Sand hills of Loup Fork.
11. *Pituophis sayi*, B. & G. Sand hills of Loup Fork.
12. *Amphibolus sayi.* Fort Benton on Missouri River.
13. *Bascanion flaviventris.* Head of Loup Fork.

14. *Chlorosoma vernalis.* Yellowstone River.
15. *Scelophorus consobrinus.*
16. *Scelophorus graciosus.*
17. *Holbrookia maculata.*
18. *Holbrookia douglassi.*
19. *Cnemidophorus sexlineatus.*
20. *Plestiodon leptogrammus.*
21. *Plestiodon multivirgatum.*
22. *Plestiodon inornatum.*
23. *Plestiodon septentrionalis.*
24. *Rana halecina.*
25. *Bufo americanus.*
26. *Bufo cognatus.*
27. *Bufo woodhousi.*
28. *Siredon.*

RECENT MOLLUSCA.

An interesting series of recent fluviatile and land *Mollusca* were secured during the several expeditions from various portions of the Upper Missouri. The fresh-water shells were very kindly examined by Mr. Isaac Lea, the celebrated conchologist, of Philadelphia. In some remarks before the Philadelphia Academy in regard to the above collection, and one obtained by Mr. Kennicott from the Red River of the North, Mr. Lea says:

"It is not to be understood that either of these collections, made under adverse circumstances and at times of great personal danger, should be full representatives of this branch of the fauna of these countries. But they are sufficient to prove that zoological life, so far as represented by molluscs, is nearly, if not quite, the same, as that of the Ohio River basin, as well as that of the Missouri River and a part of the Lower Mississippi and Red River of the South. The knowledge of a part of the species from these remote districts proves to us the wide-spread distribution of the same species, as we find every one of them in the Ohio River at Cincinnati, Marietta, and Pittsburg, and this is the more remarkable, as the waters of the Red River of the North are embraced in a different system of drainage, flowing as they do into Hudson's Bay at about 52 degrees north latitude. Here is seen an immense area of country producing in its waters nearly the same life as regards the molluscs, a fact highly interesting to the zoologist."

To Mr. W. G. Binney were transmitted the land shells, which were examined by him with great care. I quote the following remarks from his letter:

"These shells are all of value, as they form the first contribution to our knowledge of the species found in those regions. They are, however, for the most part alluvial. *Succinea Haydeni* is the only perfectly fresh species, the animal being preserved in alcohol."

"*Helix costata* was found in myriads, probably the contribution of many small streams above. Of the previously known species it is the most interesting, having been noticed previously in few localities and small numbers. If any argument were needed to establish the point of *H. minuta* (Say) being identical with the European *H. pulchella* (Mull.) it might be found in the fact of the ribbed variety being also found in this country."

The following catalogue comprises all the fresh-water and land shells known to us on the Upper Missouri:

FLUVIATILE SHELLS.

1. *Unio alatus*, Say. Big Sioux River.
2. *Unio levississimus*, Lea. Big Sioux River.
3. *Unio luteolus*, Lam. Big Sioux River.
4. *Unio asperimus*, Lea. Big Sioux River.
5. *Unio rectus*, Lea. Big Sioux River.
6. *Unio elegans*, Lea. James River.
7. *Unio zizzag*, Lea. White Earth River.
8. *Unio anadontoides*, Lea. James River.
9. *Magaritana complanata*, Lea. Fort Clark in Missouri.
10. *Anadonta Ferussaciana*, Lea. White River, Nebraska.
11. *Lymnea elodes*, Say. Mouth Big Sioux River.
12. *Lymnea nuttalliana*, Lea. Mouth Big Sioux River.
13. *Lymnea humilis*, Say. Mouth Big Sioux River.
14. *Lymnea Haydeni*, Lea. Mouth Big Sioux River.
15. *Lymnea Kirtlandiana*, Lea. Mouth Big Sioux River.
16. *Lymnea umbrosa*, Say. Grindstone Creek, Nebraska Territory.
17. *Lymnea lubricoides*, Lea. Grindstone Creek, Nebraska Territory.
18. *Lymnea Philadelphica*, Lea. Grindstone Creek, Nebraska Territory.
19. *Planorbis bicarinatus*, Say. Mouth Big Sioux River.
20. *Planorbis trivolvis*, Say. Mouth Big Sioux River.
21. *Planorbis lentus*, Say. Mouth Big Sioux River.
22. *Planorbis parvus*, Say. Mouth Big Sioux River.
23. *Planorbis campanulatus*, Say. Mouth Big Sioux River.
24. *Physa heterostropha*. Mouth Big Sioux River.
25. *Physa integra?*, Hald. Mouth Big Sioux River.
26. *Physa elongata*, Say. Mouth Big Sioux River.
27. *Physa ampularia*, Say. Mouth Big Sioux River.
28. *Psidium —?* Grindstone Creek.
29. *Cyclas —?* Grindstone Creek.
30. *Daphnia —?* Grindstone Creek.
31. *Amnicola porata*, Say. Fort Berthold.
32. *Amnicola lapidaria*, Say. Fort Berthold.

LAND SHELLS.

33. *Helix minuscula*, Binney. Council Bluffs, Nebraska Territory.
34. *Helix lineata*, Say. Council Bluffs, Nebraska Territory.
35. *Helix striatella*, Anthony. Council Bluffs, Nebraska Territory.
36. *Helix inflecta*, Say. Council Bluffs, Nebraska Territory.
37. *Helix hirsuta*, Say. Council Bluffs, Nebraska Territory.
38. *Helix solitaria*, Say. Council Bluffs, Nebraska Territory.
39. *Helix alternata*, Say. Council Bluffs, Nebraska Territory.
40. *Helix elevata*, Say. Council Bluffs, Nebraska Territory.
41. *Helix fallax*, Say. Council Bluffs, Nebraska Territory.
42. *Helix concava*, Say. Council Bluffs, Nebraska Territory.
43. *Helix ligera*, Say. Council Bluffs, Nebraska Territory.
44. *Helix profunda*, Say. Near Fort Leavenworth, Kansas Territory.
45. *Helix multilineata*, Say. Near Fort Leavenworth, Kansas Territory.
46. *Helix monodon*, Rackett. Near Fort Leavenworth, Kansas Territory.
47. *Helix pulchella*, Mull. Near Fort Leavenworth, Kansas Territory.
48. *Helix costata*, Mull. Near Fort Leavenworth, Kansas Territory.
49. *Helix arborea*, Say. Drift on the Missouri, near Fort Berthold.
50. *Helix cheresina*, Say. Drift on the Missouri, near Fort Berthold.
51. *Helix electrina*, Gould. Drift on the Missouri, near Fort Berthold.

52. *Helix cooperi*, (new spec.,) Binney. Black Hills, Nebraska Territory.
53. *Pupa nebraskana*, (new spec.,) W. G. Binney. Fort Berthold, Nebraska Territory.
54. *Pupa blandi*, (new spec.,) W. G. Binney. Fort Berthold.
55. *Pupa armigera*, Say. Fort Berthold.
56. *Pupa pentodon*, Say. Council Bluffs, Nebraska Territory.
57. *Pupa modesta*, Say. Council Bluffs, Nebraska Territory.
58. *Pupa badia*, Adams. Council Bluffs, Nebraska Territory.
59. *Bulimus lubricus*, Mull. Fort Berthold, on Missouri.
60. *Succinea venusta*, Say. Yellowstone.
61. *Succinea retusa*, Lea. Yellowstone.
62. *Succinea haydeni*, (new spec.,) W. G. Binney. Yellowstone.
63. *Succinea lineata*, (new spec.,) W. G. Binney. Fort Union and Yellowstone.
64. *Succinea nuttalliana*, Lea. Fort Union.
65. *Succinea obliqua*, Say. Fort Berthold, Nebraska Territory.

BOTANY.

The collection of recent plants from the Upper Missouri is very large and numerous in species. Comparatively few of them have been determined and their names presented in this list. The complete catalogue, with the necessary remarks and descriptions of new species, will appear in the final report.

The vegetation of Kansas and the southern and southeastern portions of Nebraska is luxuriant in the highest degree. The broad bottom prairies of the Missouri, from Council Bluffs to the mouth of the Niobrara, are of inexhaustible fertility, sustaining a vegetation variable in its character and of enormous growth. The upland prairies possess a soil composed of yellow marl, well adapted to agriculture and grazing. All that portion of Nebraska which borders upon the Missouri, for one hundred to one hundred and fifty miles into the interior, is already settled to a great extent, and the traveler sees in prospective many of the finest farms in the West. The beautiful valley of the Platte cannot be surpassed for fertility of soil and the variety and luxuriance of its vegetation. Scarcely a section of land can be seen at the present time that is not already occupied by the courageous and persevering pioneer, and made to yield most abundant crops. Sufficient timber occurs along the banks of ravines and streams for all economical purposes. After passing above latitude 43°, the soil becomes less fertile, climate much drier, and vegetation less luxuriant. The whole country, though well adapted for the purposes of pasturage, is not well suited for agriculture, except in comparatively few localities. There is very little timber but that which skirts the streams, and consists for the most part of cottonwood, elm, ash, and boxwood. Reaching the mountains, as the Bear's Paw, Snowy, Girdle, Black Hills, or Laramie Hills, an inexhaustible supply of pine timber is found, with many other varieties of trees common to the northern regions. The numerous broad valleys in the Black Hills possess a very fertile soil and abound in springs of pure water, and the time cannot be far distant when this region as well as the country around Fort Laramie will be settled by a thriving population, and the vast forests of pine rendered serviceable to the wants of man.

That there is a marked improvement in the character of the country as we approach the mountains has already been noticed in published reports. The valley of the Yellowstone River, after passing the mouth

of the Big Horn, is spoken of by both traders and Indians as quite fertile, abounding with excellent timber, fine clear springs of water, and a luxuriant vegetation. The Crows, who now possess this region, regard it as the finest country in the world. The immense beds of gypsum, of the Jurassic formation, along the eastern slope of the Rocky Mountains, some of which are twenty feet in thickness, would furnish an inexhaustible supply of that excellent fertilizer.

Much might be said in regard to the influence of soil, climate, geological structure, &c., upon the vegetation of the Upper Missouri, as well as the geographical distribution of species; but time will not permit, though many facts have been gathered bearing upon these points. These will appear with the more complete catalogue when the final report is published.

The following meteorological notes were taken at Fort Pierre and vicinity in the spring of 1855, and though very brief may prove of some interest:

March 7.—Weather fair; grass starting up fresh and green near Black Hills. Grasshoppers and ants quite active. Antelope returning to the open prairies from their winter home in the north.

March 8.—Weather very fine and warm. Saw common striped snake, (*Eutainia parietalis.*)

March 9.—Saw red-headed woodpecker, (*Melanerpes erythrocephalus,*) and in company with it a beautiful black glossy woodpecker about the same size, (*Melanerpes torquatus.*)

March 10.—Saw two fine plants on the south side of Bear Peak, six hundred feet above the level prairie around it. One of them, *Anemone patens*, was in blossom; the other was just coming into bloom.

The ice broke up in the Missouri River March 6, as far as Fort Clark, latitude 47°. Then came several days of stormy weather, during which the river was frozen over a second time so firm as to sustain heavily loaded teams. The ice again broke up on the 22d for about the same distance up the Missouri. At Fort Union the ice did not yield until the 3d of April.

April 9.—Four species of umbelliferous plants in bloom; heavy frost during the night, so that ice formed upon the little pools an inch in thickness; grasshoppers quite active and abundant.

April 10.—Cold; some snow.

April 11.—Fair weather; a strong breeze blowing though quite warm. A small species of *Carex* in blossom. Saw yellow-shafted flicker, (*Colaptes auratus,*) and meadow lark, (*Sturnella neglecta.*) At night the frogs commenced a gentle croaking, for the first time this spring.

April 12.—Various kinds of insects quite abundant; common garter snake, (*E. parietalis,*) killdeer, (*Charadrius vociferus,*) geese, and ducks abundant; American elm (*Ulmus americana*) in full bloom.

April 13.—Saw a large flock of swans, (*Cygnus buccinator;*) a beautiful *Ranunculus* in bloom, (*R. glaberrimus.*) The long-billed curlew (*Numenius longirostris*) quite abundant running on the upland prairie.

April 16.—The 13-lined squirrel (*Spermophilus tridecemlineatus*) quite abundant on the high prairie.

April 20.—Saw to-day birds: wild geese, (*Anser erythropus,*) kingbird, (*Tyrannus crinitus,*) robin redbreast, (*Turdus migratorius,*) (a few robins were seen near Fort Pierre, April 1,) the meadow lark, flicker, killdeer, turkey buzzard, (*Cathartes aura,*) mourning dove, (*Ectopistes carolinensis,*) common cowbird, (*Molothrus pecoris,*) very abundant; also a gull (*Larus franklinii*) was seen on the river. The following plants

were in bloom: *Astragalus caryocarpus, Shepherdia argentea*, a species of *Salix, Populus angulata*, and a fine bluebell, (*Mertensia virginica.*)

April 23.—Red-winged blackbird (*Agelaius phœniceus*) abundant. *Prunus americana* in bloom; *Symphoricarpus occidentalis* and *Artemisia* in full foliage.

May 6.—Saw blue heron, (*Ardea herodias;*) *Cornus stoloniferus* in bloom.

May 7.—Kingfisher (*Ceryle alcyon*) seen on the Teton River.

May 8.—Saw cliff swallow, (*Cotyle riparia;*) also a large rattlesnake, (*Crotalus confluentus;*) *Castileia sessiliflora* in full bloom.

May 9.—*Senecio aureus*, a species of *Salix*, and a *Juncus* in full bloom.

May 10.—In the valley of White River the trees are in full foliage, and the bottom and upland prairies are covered with a rich green carpet of grass, and multitudes of plants are now in blossom. *Malvastrum coccineum* just coming into bloom. *Mammalaris nuttalli* and *Allium stellatum* are in full bloom.

May 12.—*Ranunculus aquatilis* in bloom. At this time, so many birds and flowers, stange to me, have made their appearance that I cannot indicate them. Spring has fairly arrived, and summer is approaching. During the month of May considerable rain fell, so that the streams were much swollen. But for six or eight months past we have had very little rain, not more than one or two inches. All the vegetation was parched with drought.

The "June rise" is said by the mountaineers to commence invariably at the time when the roses are in bloom. This year the roses were in blossom June 1, though I saw some in flower May 14 in the White River Valley. The rise in the waters of the Missouri commenced at Fort Pierre, June 11, 4 inches the first day, 5 inches the second, 18 inches the third, 4 to 8 inches the fourth, and afterward falling gradually. This is usually called by the mountaineers the "big rise," and is due to the melting of the snows, which accumulate during the winter in the ravines and valleys of the mountains near the sources of the Missouri. There was comparatively little snow in the mountains last winter, and there has been very little rain during the spring, consequently the rise this year is quite small.

June 1.—*Yucca angustifolia, Polygala alba, Opuntia missouriensis*, are in full bloom. The cacti bear the most beautiful blossoms of any of the plants of the prairie.

The principal part of the plants enumerated in the following catalogue were identified by the distinguished botanist, Dr. George Engelmann, of Saint Louis, Missouri. A few were determined by Dr. Torrey, and the remainder by the writer. A good collection of mosses, lichens, and fungi was obtained, but the species have not yet been studied, though they will be ready for the final report. It will be seen, therefore, that no department of the geology and natural history of the Upper Missouri has been neglected in our explorations.

1. *Clematis Virginiana*, Linn. Very abundant from the mouth of the Missouri to Council Bluffs.
2. *Clematis ligusticifolia*, Nutt. Fort Pierre to the mountains. Very abundant about Fort Union; also at Fort Laramie, head of the Platte.
3. *Pulsatilla patens*, D. C. This plant is called by the Indians the harbinger of spring. I saw it on the south side of Bear Peak, March 9, 1855, just coming into bloom. It is found quite abundantly in the White River Valley; also in the sand hills of Loup Fork.

4. *Anemone Pennsylvanica*, Lynn. Abundant from the mouth of the Missouri to the mountains, though most common below latitude 43°.
5. *Anemone Caroliniana*, Walt. Quite common around Council Bluffs to Niobrara River.
6. *Anemone cylindrica*, Gray. This plant is quite rare; only a few individuals were seen near the mouth of the Big Sioux River, and on Loup Fork.
7. *Ranunculus repens*, var. *Marylandicus*, Torr. and Gray. Low, wet places on the Upper Missouri.
8. *Ranunculus Pennsylvanicus*, Linn. Council Bluffs, Niobrara, Platte Valley.
9. *Ranunculus recurvatus*, Poir. Mouth of the Missouri to Niobrara River; also, sparingly, in White River Valley.
10. *Ranunculus abortivus*, Linn. Wet and sandy places to Niobrara; sparingly to the mountains.
11. *Ranunculus sceleratus*, Linn. Not rare throughout the Upper Missouri country.
12. *Ranunculus glaberrimus*, Hook. The only locality in which I ever saw this plant was at Grindstone Hills, near Bad Lands, where it was in bloom on the 9th of April.
13. *Ranunculus cymbalaria*, Pursh. Seen on the Yellowstone and Missouri.
14. *Ranunculus aquatilis*, Linn. Very abundant in the White River Valley, in the streams and little lakes.
15. *Myosurus minimus*, Linn. Missouri bottoms, opposite Saint Joseph's; also on the upland prairie, near Fort Pierre.
16. *Aquilegia Canadensis*, Linn. Does not extend above Council Bluffs or the Big Sioux.
17. *Isopyrum biternatum*, Torr. and Gray. Seen sparingly as far up the Missouri as the mouth of the Platte.
18. *Delphinium tricorne*, Mich. Extends to the mouth of the Big Sioux; range to Niobrara, in latitude 43°.
19. *Delphinium azureum*, Mich. Abundant on the open prairies to the mountains.
20. *Delphinium viriscens*, Nutt. Fort Pierre.
21. *Thalictrum cornuti*, Linn. Not rare to mountains.
22. *Thalictrum dioicum*, Linn. Abundant to Niobrara River.
23. *Hydrastis Canadensis*, Linn. Found only in the Carboniferous limestone region to Council Bluffs; perhaps rarely to Big Sioux River.
24. *Actea rubra*, Bigelow. Council Bluffs.
25. *Asimina triloba*, Dunal. Common Papaw. Extends up the Missouri to the mouth of the Big Sioux River.
26. *Menispermum Canadensis*, Linn. Most abundant in the limestone regions to Council Bluffs; seen rarely on wooded banks to the Yellowstone.
27. *Berberis aquifolium*, Pursh. A very abundant shrub in the Laramie range of hills and Black Hills.
28. *Podophyllum peltatum*, Linn. Abundant along the lower part of the Missouri River, gradually ceasing at the mouth of the Platte.
29. *Nelumbeum luteum*, Willd. Lower portion of the valley of the Platte, and on the broad, wet bottoms about Omaha City. It is now quite rare, on account of the great use of both roots and seeds for food by the Omaha, Otoe, and Pawnee Indians.
30. *Nymphea odorata*, Sit. Found by Dr. Cooper in Kansas.
31. *Argemone Mexicana*, Linn. Found only at Bellevue, Nebraska Territory: fine yellow flowers.

32. *Argemone hispida*, Gray. Bad Lands, White River, Loup Fork, Fort Laramie.
33. *Sanguinaria Canadensis*, Linn. Rich woods about Council Bluffs.
34. *Corydalis aurea*, Willd. Not seen on the bottoms to mountains.
35. *Dicentra cucullaria*, D. C. In shady woods to mouth Big Sioux.
36. *Nasturtium palustre*, D. C. Not uncommon to mountains.
37. *Nasturtium obtusum*, Nutt. On the Upper Missouri and Yellowstone.
38. *Nasturtium sinuatum*, Nutt. Fort Clark, Upper Missouri.
39. *Nasturtium sessiliflorum*, Nutt. Along Missouri.
40. *Nasturtium limosum*, Nutt. Along low bottoms near to Council Bluffs.
41. *Dentaria laciniata*, Muhl. Shady woods around Council Bluffs.
42. *Nasturtium calycinum*, Engelman, nov. sp. Annuum erectum seu diffusum, hirsutulum; folis caulinis anguste oblongis sinuatis seu subpinnatifidis bassi auriculata arcte sessilibus vel semi amplexicaulibus; racemis confertifloris demum elongatis; pedicellis fiore flavido et silicula ovoidea acuta parva hispidula cum stylo gracilis vix longioribus; calyce persisente. Sandy bottoms of the Yellowstone River, Fort Sarpy to Fort Union. In aspect as well as in the style, (fully a line long on a silicle 1½ line in length,) this species resembles some *Vesicariæ*, but the numerous seeds are those of a *Nasturtium*. The stem is about a foot high, often much branched and diffuse. The ovate lanceolate acutish sepals commonly persist until the valves of the pod had fallen. The pubescence of the pod consists of very short and pointed thick-based simple hairs. (A. Gray.)
43. *Arabis Canadensis*, Linn. Common along Missouri to Fort Union.
44. *Arabis hirsuta*, Scop. Fort Union and Bad Lands.
45. *Arabis lævigata*, D. C. Shady woods to mouth of Platte.
46. *Arabis dentata*, Torr. and Gray. Council Bluffs.
47. *Sisymbrium canescens*, Nutt. Fort Pierre and Yellowstone.
48. *Erysimum asperum*, D. C. Abundant on the high prairies to Fort Pierre and Fort Union.
49. *Erysimum cheiranthoides*, Linn. Yellowstone and Bad Lands.
50. *Stanleya pinnatifida*, Nutt. Abundant on the marl banks near Niobrara River, Fort Pierre; rarely on the Yellowstone.
51. *Stanleya integrifolia*, James. Dr. Gray thinks it is a different form of last species.
52. *Vesicaria ludoviciana*, D. C. Sterile hills, Fort Pierre, and Yellowstone.
53. *Vesicaria alpina*, Nutt. Same as preceding.
54. *Vesicaria didymocarpa*, Hook. Bad Lands.
55. *Sinapis nigra*, Linn. About old houses and cultivated fields, Council Bluffs and Fort Pierre.
56. *Capsella bursa-pastoris*, Linn. Same as preceding.
57. *Draba micrantha*, Nutt. Bad Lands.
58. *Draba Caroliniana*, Walt. Council Bluffs.
59. *Draba brachycarpa*, Nutt. Lower Missouri.
60. *Lepidium ruderale*, Linn. Along Missouri to mountains.
61. *Lepidium Virginicum*, Linn. Fort Pierre and Yellowstone.
62. *Cleome integrifolia*, Torr. and Gray. Bad Lands, Fort Union, Yellowstone, Bad Lands of Judith, Platte Valley, Fort Laramie, and not a generally diffused plant, but growing abundantly in localities.
63. *Polanisia uniglandulosa*, Gray. First seen on gravelly hills about Fort Pierre; also on Loup Fork.
64. *Viola palmata*, Linn. Fort Pierre.

65. *Viola cucullata*, Sit. Fort Pierre.
66. *Viola Nuttallii*, Pursh. Bad Lands.
67. *Viola Canadensis*, Linn. Fort Pierre.
68. *Viola tricolor*, Linn. Council Bluffs.
69. *Viola delphinifolia*, Nutt. Prairies around Council Bluffs.
70. *Silene antirrhina*, Linn. Council Bluffs.
71. *Silene stellata*, Ait. Dixon's Bluffs.
72. *Alsine Michauxi*, Fenzl. Mouth Big Sioux.
73. *Cerastium nutans*, Raf. White River, Bad Lands.
74. *Cerastium arvense*, Linn. Council Bluffs.
75. *Moehringia lateriflora*, Linn. Along Missouri to Council Bluffs.
76. *Paronychia sessiliflora*, Nutt. Fort Union, Laramie Peak, Black Hills.
77. *Stellaria longipes*, Goldie. Council Bluffs.
78. *Portulaca oleracea*, Linn. On saline clay soil, Teton River, near Fort Pierre; also near base of Black Hills, (indigenous.)
79. *Claytonia Virginica*, Linn. Rocky woods, as high up the Missouri as Council Bluffs.
80. *Abutilon avicennæ*, Gaertn. Naturalized near Council Bluffs.
81. *Malvastrum coccineum*, Gray. Makes its appearance on the Missouri about latitude 43°, and continues to the mountains.
82. *Tilia Americana*, Linn. Abundant to Big Sioux; seen sparingly to mouth of Niobrara, where it ceases.
83. *Linum rigidum*, Pursh. Throughout the prairie portion of the Upper Missouri.
84. *Linum perenne*, Linn. Fort Pierre and Fort Union.
85. *Linum bootti*, Planchon. Found by Dr. Cooper in Kansas.
86. *Oxalis stricta*, Linn. Generally diffused.
87. *Oxalis violacea*, Linn. Rich prairies and cultivated fields around Council Bluffs; seen nearly as high as Niobrara, in full bloom June 20, 1857.
88. *Oxalis corniculata*, Linn. Upper Missouri.
89. *Geranium maculatum*, Linn. Common to Niobrara.
90. *Geranium carolinianum*, Linn. Mouth of Big Sioux.
91. *Impatiens pallida*, Nutt. Shady woods to mountains.
92. *Impatiens fulva*, Nutt. Council Bluffs and Big Sioux.
93. *Xanthoxylum Americanum*, Mill. Woody bottoms, and islands of the Missouri, to Fort Pierre.
94. *Ptelia trifoliata*, Linn. Around Council Bluffs.
95. *Rhus glabra*, Linn. Council Bluffs, White River Valley.
96. *Rhus copallina*, Linn. Abundant in Missouri and Kansas.
97. *Rhus toxicodendron*, Linn. Abundant in woody places to the mountains.
98. *Rhus aromatica*, Ait. Along Missouri.
99. *Rhus trilobata*, Nutt. First makes its appearance about latitude 43°, and occurs abundantly on sterile hills to the mountains.
100. *Vitis riparia*, Michx. Banks of Missouri, Bellevue, N. T.
101. *Vitis indivisa*, Willd. Big Sioux River.
102. *Ampelopsis quinquefolia*, Michx. Very common in woody bottoms throughout the country, but grows most luxuriant in the rich woods from mouth of Missouri to Big Sioux, where it often so clothes old dry trees that they seem still alive.
103. *Rhamnus lanceolatus*, Pursh. Council Bluffs.
104. *Ceanothus sanguineus*, Pursh. Mouth of White River.
105. *Ceanothus ovalis*, Bigelow, var. *pubescens*. Common on the Cretaceous hills below Fort Pierre; also in the sand hills of Loup Fork on the Niobrara River.

106. *Celastrus scandens*, Linn. Along Missouri to Fort Union.
107. *Euonymus atropurpureus*, Jacq. Woody bottoms to Fort Union.
108. *Euonymus Americanus*, Linn. Mouth of Platte.
109. *Staphylea trifolia*, Linn. Council Bluffs.
110. *Æsculus glabra*, Willd. Missouri bottoms to Big Sioux River.
111. *Acer dasycarpum*, Ehshart. Bellevue, Nebraska.
112. *Acer rubrum*, Linn. Highest limit on Missouri, latitude 42°.
113. *Acer saccharinum*, Wang. Limestone regions of Kansas and southern portion of Nebraska.
114. *Negundo aceroides*, Moench. One of the few trees which extends to the mountains.
115. *Polygala alba*, Nutt. On sterile hills to Fort Union.
116. *Polygala verticillata*, Linn. Moist places on prairies; Fort Pierre; Bad Lands.
117. *Polygala senega*, Linn. Council Bluffs.
118. *Vicia Americana*, Muhl. Upper Missouri generally.
119. *Lathyrus linearis*, Nutt. Upper Missouri generally.
120. *Lathyrus polymorphus*, Nutt. White River Valley.
121. *Lathyrus venosus*, Muhl. Rich bottoms, Big Sioux.
122. *Phaseolus pauciflorus*, Benth. Bad Lands.
123. *Amphicarpea monoica*, Nutt. White River valley. Fort Clark.
124. *Apios tuberosa*, Moench. Along sandy woody bottoms of Missouri. A species of mouse gathers large numbers of the tubers of this plant for his winter store. These "cachés" (as they are called) are eagerly sought by the squaws, and the tubers taken and used as food. I have seen several bushels of the roots in a single lodge. Cooked with buffalo-meat, they make a very palatable dish.
125. *Glycyrhiza lepidota*, Nutt. Diffused generally.
126. *Psoralea lanceolata*, Pursh. From Bellevue to Yellowstone.
127. *Psoralea floribunda*, Nutt. Big Sioux River to Bad Lands.
128. *Psoralea campestris*, Nutt. Bad Lands.
129. *Psoralea argophylla*, Pursh. A most beautiful plant, covering the plain as with silvery velvet. Big Sioux to mountains.
130. *Psoralea cuspidata*, Pursh. Fort Pierre to Bad Lands.
131. *Psoralea esculenta*, Pursh. Affords the Indians a very nourishing farinaceous root upon which they subsist almost entirely in the spring and early summer months, when game is scarce. It is also a great favorite of the grizzly bear.
132. *Amorpha fruticosa*, Linn. A common shrub, above Missouri to mountains.
133. *Amorpha canescens*, Nutt. Very abundant on the upland prairies, Loup Fork, and Niobrara River.
134. *Amorpha nana*, Nutt. Fort Laramie and high up the Missouri.
135. *Dalea aurea*, Nutt. Bad Lands.
136. *Dalea alopecuroides*, Willd. Big Sioux River.
137. *Dalea laxiflora*, Pursh. Fort Pierre to Yellowstone.
138. *Petalostemum candidum*, Mich. Big Sioux River.
139. *Petalostemum multiflorum*, Nutt. Fort Pierre to Bad Lands.
140. *Petalostemum violaceum*, Mich. Upper Missouri to Bad Lands.
141. *Petalostemum villosum*, Nutt. Bad Lands.
142. *Trifolium stoloniferum*, Muhl. Bad Lands.
143. *Trifolium pratense*, Linn. Lower Missouri.
144. *Trifolium repens*, Linn. Lower Missouri.
145. *Hosackia Purshiana*, Benth. Sandy bottoms of Missouri.
146. *Astragalus hypoglottis*, Linn. White River to Bad Lands.

147. *Astragalus gracilis*, Nutt. Bad Lands to the Yellowstone.
148. *Astragalus striatus*, Nutt. Fort Pierre to Bad Lands, covering prairies like clover-fields.
149. *Astragalus Missouriensis*, Nutt. Fort Pierre to Fort Union.
150. *Astragalus caryocarpus*, Ker. Fort Pierre to Bad Lands.
151. *Astragalus Plattensis*, Nutt. Fort Pierre.
152. *Astragalus Canadensis*, Linn. Fort Pierre to Bad Lands.
153. *Astragalus racemosus*, Pursh. Abundant in the sandy bottoms of Missouri; Cedar Island.
154. *Astragalus Drummondi*, Douglass. Sterile hills around Fort Union.
155. *Astragalus adsurgens*, Pall. James River.
156. *Phaca cæspitosa*, Nutt. Bad Lands.
157. *Phaca longifolia*, Nutt. Bad Lands.
158. *Phaca pectinata*, Hook. Upland prairies on the Yellowstone River, abundant.
159. *Phaca elongata*, Hook. Fort Pierre to Fort Union.
160. *Orytropis Lamberti*, Pursh. Very abundant on prairies around Big Sioux and Niobrara Rivers.
161. *Oxytropis splendens*, Douglass. James River.
162. *Homalobus multiflorus*, Nutt. Big Sioux to Bad Lands.
163. *Kentrophyta montana*, Nutt. Abundant in sandy river-bottoms on the Yellowstone.
164. *Hedysarum boreale*, Nutt. Abundant, mouth of Yellowstone.
165. *Desmodium Canadense*, D. C. Fort Clark.
166. *Desmodium Dillenii*, Darl. Big Sioux River.
167. *Desmodium paniculatum*, D. C. Bellevue, W. T.
168. *Desmodium nudiflorum*, D. C. Bellevue, W. T.
169. *Lespedera capitata*, Michx. Abundant on the rich bottoms about Council Bluffs, Big Sioux.
170. *Lespedera hirta*, Ell. On Missouri.
171. *Crotalaria sagittalis*, Michx. Big Sioux River.
172. *Lupinus pusillus*, Pursh. Common on the Yellowstone.
173. *Lupinus perennius*, Linn. Platte Valley.
174. *Thermopsis rhombifolia*, Nutt. From Council Bluffs to Fort Pierre; Bad Lands, &c.
175. *Sophora sericea*, Nutt. White River Valley; Fort Pierre.
176. *Gleditschia tricanthos*, Linn. Occurs as high on the Missouri as Big Sioux.
177. *Cercis Canadensis*, Linn. Same as preceding.
178. *Cassia Chæmacrista*, Linn. Sandy bottoms of Missouri, from Council Bluffs to White River.
179. *Desmanthus brachylobus*, Benth. Council Bluffs and Platte Valley; rich bottoms.
180. *Schrankia uncinata*, Willd. Gravelly hills on the Upper Missouri generally.
181. *Gymnocladus Canadensis*, Lam. Abundant in woody bottoms to Big Sioux.
182. *Baptisia leucophea*, Nutt. Platte Valley.
183. *Prunus Americana*, Marsh. Fort Pierre.
184. *Prunus pumila*, Linn. Abundant in the sand-hills of Loup Fork; along Missouri River near Little Soldier's Camp.
185. *Prunus serotina*, Ehrh. Council Bluffs.
186. *Prunus Virginiana*, Linn. Generally diffused.
187. *Gillenia stipulacea*, Nutt. Mouth of Big Sioux.
188. *Gillenia trifoliata*, Moench. Mouth of Big Sioux.
189. *Agrimonia eupatoria*, Linn. Bellevue, N. T.

190. *Agrimonia parviflora*, Ait. Around Fort Union.
191. *Chœmorhodas erecta*, var. *Nuttallii*. Torr. and Gray. Big Bend and Yellowstone.
192. *Geum strictum*, Ait. White River to Yellowstone.
193. *Geum album*, Gmel. Fort Pierre and Mandan village.
194. *Geum triflorum*, Pursh. Fort Union.
195. *Potentilla Norvegica*, Linn. Council Bluffs to Yellowstone.
196. *Potentilla paradoxa*, Nutt. Along banks of Missouri.
197. *Potentilla effusa*, Dougl.? Prairies near Fort Clark.
198. *Potentilla Pennsylvanica*, Linn., var. *strigosa*. Bad Lands.
199. *Potentilla diversifolia*, Lehm. Bad Lands.
200. *Potentilla rigida*, Nutt. Yellowstone.
201. *Potentilla Canadensis*, Linn. Big Sioux River.
202. *Potentilla anserina*, Linn. Niobrara run to Fort Pierre.
203. *Potentilla fructicosa*, Linn. On the Yellowstone.
204. *Potentilla arguta*, Pursh. Fort Clark and Fort Union.
205. *Fragaria vesca*, Linn. Along Missouri to Yellowstone.
206. *Fragaria Virginica*, Ehsh. Fort Union.
207. *Sanguisorba annua*, Nutt. Fort Union.
208. *Rubus occidentalis*, Linn. Council Bluffs.
209. *Rubus strigosus*, Mich. Sparingly on Yellowstone.
210. *Rubus villosus*, Ait. Council Bluffs.
211. *Rosa blanda*, Ait. On prairies generally.
212. *Rosa lucida*, Ehrh. White River; Fort Pierre.
213. *Cratægus punctata*, Jacq. White River; Big Bend, &c.
214. *Crataegus tomentosa*, var. *mollis*, Gray. Mouth of Big Sioux.
215. *Amelanchier Canadensis*, Torr. and Gray. Common throughout the Upper Missouri country; bears a delicious fruit, which ripens in June.
216. *Epilobium angustifolium*, Linn. Not uncommon in Kansas, also near Council Bluffs.
217. *Œnothera biennis*, Linn. Common along the valley of Missouri to the mountains.
218. *Œnothera albicaulis*, Nutt. White River Valley and Yellowstone; rare.
219. *Œnothera cespitosa*, Nutt. Arid hills of Upper Missouri.
220. *Œnothera serrulata*, Nutt. Council Bluffs to Fort Pierre.
221. *Œnothera pinnatifida*, Nutt. Bad Lands.
222. *Gaura biennis*, Linn. Along Missouri to Council Bluffs.
223. *Gaura coccinea*, Nutt. Common on high prairies and hills from Council Bluffs to the mountains.
224. *Ludwigia palustris*, Ell. Wet places in Platte Valley, near Loup Fork.
225. *Circea lutetiana*, Linn. Fertile woody places along Missouri to Niobrara.
226. *Myriophyllum spicatum*, Linn. Common in ponds throughout upper Missouri.
227. *Hepparis vulgaris*, Linn. In standing pools, Upper Missouri.
228. *Mentzelia ornata*, Torr. and Gray. Arid argillaceous hills from latitude 43° to the mountains.
229. *Mentzelia nuda*, Torr. and Gray. Same as preceding.
230. *Opuntia Missouriensis*, D. C. Common throughout the Upper Missouri region.
231. *Opuntia fragilis*, Nutt. Peculiar to arid plains, Upper Missouri.
232. *Opuntia.*
233. *Mammalaris vivipara.* Seen on the rich bottoms between Niobrara and Fort Pierre; bears beautiful purple blossoms.

234. *Mammalaris Nuttalli.* Common throughout the Upper Missouri country above Fort Pierre; most abundant in White River Valley.
235. *Ribes Missouriensis*, Nutt. Woody limestone banks around Council Bluffs.
236. *Ribes floridum*, Linn. Common on the Upper Missouri and valley of Yellowstone.
237. *Ribes aureum*, Pursh. Banks and ravines along Missouri and Yellowstone.
238. *Echinocystis lobata*, Torr. and Gray. Durions' Hills on Missouri.
239. *Penthorum sedoides*, Linn. In wet places, Platte Valley; mouth of Loup Fork.
240. *Heuchera Americana*, Linn. Not rare in woody places along Missouri.
241. *Hamamelis Virginica*, Linn. Abundant in limestone woods along Missouri to mouth of the Platte River.
242. *Zizia aurea*, Koch. Prairies along Missouri to Big Sioux and Niobrara.
243. *Polytænia Nuttallii*, D. C. Dry argillaceous hills and upland prairies around Fort Pierre; also on the Yellowstone.
244. *Sium lineare*, Michx. Moist places from mouth of Missouri to mountains.
245. *Thaspium barbinode*, Nutt. Rich woody places along Missouri.
246. *Thaspium aureum*, Nutt. Near Council Bluffs.
247. *Peucedanum faniculaceum*, Nutt. Common on high prairies around Council Bluffs.
248. *Osmorrhiza longistylis*, D. C. Moist fertile woods to Fort Pierre.
249. *Osmorrhiza brevtstylis*, D. C. With the preceding.
250. *Cicuta maculata*, Linn. Wet places, Platte Valley.
251. *Aralia nudicaulis*, Linn. Limestone woods to Big Sioux River.
252. *Cornus florida*, Linn. Along the rich wooded bottoms as high as Fort Leavenworth.
253. *Cornus stolonifera*, Michx. Wooded bottoms of Missouri from mouth to source.
254. *Cornus sericea*, Linn. Abundant along Missouri bottoms. The inner bark is much used by the Sioux Indians with their tobacco in proportions of three to one; called by the traders "red osier."
255. *Symphoricarpus occidentalis*, R. Br. The most abundant shrub along the rivers and streams from the mouth of the Missouri to the mountains; often called "blue wood," much used for making brooms; sometimes covers the river bottoms almost exclusively.
256. *Lonicera ciliata*, Muhl. Woody ravines, near Council Bluffs, N. T.
257. *Triosteum perfoliatum*, Linn. Not rare as high up the Missouri as mouth of Big Sioux.
258. *Sambucus Canadensis*, Linn. Common along Missouri; seen in the valley of Yellowstone.
259. *Galium aparine*, Linn. Woody places along Missouri.
260. *Galium trifidum*, Linn. Moist low spots on Missouri.
261. *Galium boreale*, Linn. Same as preceding.
262. *Galium triflorum*, Michx. Same as preceding.
263. *Cephalanthus occidentalis*, Michx. Platte Valley near Loup Fork.
264. *Oldenlandia angustifolia*, Gray. Along Missouri to Council Bluffs.
265. *Vernonia fasciculata*, Michx. Quite common on prairies, valley of Missouri.
266. *Kuhnia eupatorioides*, Linn. Council Bluffs to Niobrara.
267. *Eupatorium perfoliatum*, Linn. On rich bottom prairies near mouth of Big Sioux.

268. *Eupatorium purpureum*, Linn. Council Bluffs to James River.
269. *Eupatorium ageratoides*, Linn. Woody bottoms, Council Bluffs to Fort Pierre.
270. *Liatris spicata*, Willd. Rich bottoms, Big Sioux.
271. *Aster cordifolius*, Linn. Not uncommon, Big Sioux and Niobrara.
272. *Aster saggitifolius*, Willd. Big Sioux and Niobrara.
273. *Aster azureus*, Lindl. Council Bluffs.
274. *Aster multiflorus*, Ait. Council Bluffs.
275. *Aster sericeus*, Vent. Fort Pierre.
276. *Aster Novæ-Angliæ*, Ait. Low places on Missouri.
277. *Aster laevis*, Linn. Upper Missouri.
278. *Erigeron pumilum*, Nutt. High hills around Fort Pierre.
279. *Erigeron strigosum*, Muhl. Low places, Vermillion Prairie.
280. *Erigeron Philadelphicum*, Linn. Alluvial bottoms of Missouri.
281. *Erigeron Canadense*, Linn. Common all over Missouri country.
282. *Aplopappus spinulosus*, D. C. High prairies of Upper Missouri.
283. *Solidago rigida*, Linn.
284. *Solidago incana*, Torr. & Gray.
285. *Solidago nemoralis*, Ait.
286. *Solidago gigantea*, Ait.
287. *Solidago Missouriensis*, Nutt.
288. *Grindelia squarrosa*, Dunal. Common on high prairies from latitude 43° to the mountains; medicinal among Indians.
289. *Chrysopsis villosa*, Nutt. Common on dry hills, Fort Pierre.
290. *Silphium laciniatum*, Linn. Called by the inhabitants of the country "compass plant;" reaches its healthiest growth on the rich fertile bottoms of Missouri, but often found in great abundance on the high prairies. The highest point on the Missouri River that I have observed this plant is near latitude 44°, mouth White River; most abundant in the Platte Valley and on the broad rich bottoms between Council Bluffs and Niobrara River, where it sometimes occupies large areas to the exclusion of other vegetation. That the leaves of this plant set their faces north and south may be proved by a pocket compass. Forty-nine plants out of fifty exhibit this peculiarity. It thus becomes an excellent guide to the traveler across the pathless prairies.
291. *Silphium perfoliatum*, Linn. Seldom seen above Niobrara.
292. *Iva axillaris*, Pursh. Dry argillaceous hills. Fort Pierre and Fort Union.
293. *Ambrosia trifida*, Linn. Along streams and borders of woods from mouth of the Missouri to mountains. Quite abundant.
294. *Ambrosia coronopifolia*, Torr. and Gray. Fort Pierre.
295. *Xanthium strumarium*, Linn. Sandy bottoms of Yellowstone.
296. *Echinacea purpurea*, Moench. Purple cone flower; called rattlesnake weed in the West, and is found abundantly throughout the country. Root very pungent. Used very effectively by the traders and Indians for the cure of the bite of the rattlesnake.
297. *Lepachys columnaris*, Torr. and Gray. Common throughout the Missouri country, but most abundant from Council Bluffs to Niobrara River, on the rich broad bottom prairies. In flower July 8. Rays usually yellow, sometimes of a deep purple velvet.
298. *Lepachys pinnata*, Torr. and Gray. Vermillion Prairie. Rare.
299. *Rudbeckia hirta*, Linn. Council Bluffs.
300. *Heliopsis laevis*, Pers. Along streams in Kansas and Southern Nebraska.
301. *Helianthus giganteus*, Linn. Common on Upper Missouri.

302. *Helianthus gross-serratus*, Martens. Common on prairies.
303. *Coreopsis tripteris*, Linn. Council Bluffs.
304. *Coreopsis tinctoria*, Nutt. James River, Big Sioux, &c.
305. *Actinomeris squarrosa*, Nutt. Common in thickets and along streams in Kansas and Nebraska.
306. *Bidens connata*, Muhl. Missouri, and White River Valley.
307. *Bidens Beckii*, Torr. Council Bluffs.
308. *Dysodia chrysanthemoides*, Lag. Very abundant in prairie-dog villages on the Upper Missouri.
309. *Helenium autumnale*, Linn. Kansas and Southern Nebraska.
310. *Anthemis arvensis*, Linn. Naturalized to Fort Leavenworth.
311. *Achillea millefolium*, Linn. Found all over the prairie country of the West; must be indigenous west of the Mississippi.
312. *Antennaria plantaginea*, R. Br. Upper Missouri and Black Hills.
313. *Antennaria dioica*, R. Br. Same as last.
314. *Artemisia filifolia*, Torr. Gravelly hills along Platte; "Bad Lands.'
315. *Artemisia cana*, Pursh. In the valley of Missouri and Platte.
316. *Artemisia frigida*, Willd. From latitude 43° to mountains.
317. *Artemisia dracunculoides*. Fort Pierre to Bad Lands.
318. *Artemisia tridentata*, Nutt. Common in Bad Lands.
319. *Artemisia biennis*, Willd. In Platte Valley.
320. *Artemisia Canadensis*, Michx. Near Fort Laramie.
321. *Artemisia ludoviciana*, Nutt. Shyenne River.
322. *Gnaphalium uliginosum*, Linn. Council Bluffs.
323. *Senecio aureus*, Linn. Council Bluffs and Big Sioux.
324. *Senecio integerrimus*, Nutt. About Council Bluffs to mountains.
325. *Linosyris graveolens*, Torr. and Gray. A very common shrub from latitude 44° to mountains; sometimes associated with *Sarcobatus vermicularis*, and sometimes taking its place.
326. *Cacalia tuberosa*, Nutt. Not uncommon on the rich bottoms of the Missouri and Platte.
327. *Lygodesmia juncea*, Don. A very abundant plant all over the sterile hills of the Upper Missouri and its tributaries; grows most luxuriantly on the second upland prairie. It makes its first appearance near Council Bluffs, and extends to the mountains.
328. *Circium altissimum*, Spreng. Platte Valley.
329. *Brickelia oblongifolia*. Along Missouri River.
330. *Franseria ambrosioides*, Cab. Sandy bottoms of the Yellowstone.
331. *Sonchus asper*, Vill. Council Bluffs.
332. *Mulgedium pulchellum*, Nutt. Big Sioux River.
333. *Troximon cuspidatum*, Pursh. Council Bluffs and Big Sioux.
334. *Lobelia cardinalis*, Linn. Moist places along the Missouri to the Big Sioux; in Kansas, on Big Cottonwood Creek.
335. *Lobelia spicata*, Lam. Mouth of the Platte.
336. *Lobelia inflata*, Linn. Yellowstone Valley, where it is cultivated by the Crow Indians, and used in their religious ceremonies.
337. *Campanula rotundifolia*, Linn. Common to Fort Clark.
338. *Specularia perfoliata*, D. C. Throughout the Upper Missouri country.
339. *Arctostaphylos uva-ursa*, Spreng. Very abundant on the high rocky hills about Fort Clark; also abundant in the mountains. It is the real "kininkkinnick" of the Indians, and used by them to mix with their tobacco in preference to any other plant. The bark of *Cornus sericea* is used as a substitute only in the absence of the *A. uva-ursi*.

340. *Chimaphila umbellata*, Nutt. Black Hills.
341. *Diospyros Virginiana*, Linn. Is found in Kansas.
342. *Plantago major*, Linn. On river bottom near Fort Clark.
343. *Plantago patagonica*, var. *gnaphaloides*. Very abundant in sand soil and gravelly places on the Upper Missouri.
344. *Plantago pusilla*, Nutt. On prairies near Fort Pierre; also on the river opposite St. Joseph, in Kansas.
345. *Lysamachia stricta*, Ait. Platte Valley, upon Missouri.
346. *Utricularia inflata*, Walt. In ponds, Council Bluffs, White River Valley.
347. *Phelipœa ludoviciana*, Don. Sandy prairies, Yellowstone.
348. *Aphyllon fasciculatum*, Torr. and Gray. Great Bend of Missouri.
349. *Aphyllon uniflorum*, Torr. and Gray. Council Bluffs.
350. *Scrophularia nodosa*, Linn. Abundant along thickets and streams, Kansas and Nebraska.
351. *Chelone glabra*, Linn. Along valley of Missouri to latitude 43°.
352. *Penstemon grandiflorus*, Fraser. A beautiful plant, found along the bluffs of the Platte, banks and sandy bottoms of Missouri to mountains.
353. *Penstemon cæruleum*, Nutt. Eagle Nest Hill, White River Valley.
354. *Penstemon erianthum*, Nutt. Hills around Fort Pierre.
355. *Penstemon albidum*, Nutt. Low, with glabrous calyx. Hills around Fort Pierre.
356. *Penstemon cristatum*, Nutt. On high prairies; Upper Missouri.
357. *Penstemon gracile*, Nutt. Prairie bottoms, near Fort Pierre.
358. *Penstemon pubescens*, Solander. Fort Pierre; June.
359. *Penstemon levigata*, Solander. Fort Leavenworth; May.
360. *Mimulus virgeus*, Linn. Council Bluffs and Big Sioux.
361. *Mimulus Jamesii*, Torr. On the Platte. Dr. Cooper.
362. *Gratiola Virginica*, Linn. Quite common along the Missouri.
363. *Veronica anagallis*, Linn. Common; Council Bluffs.
364. *Veronica scutellata*, Linn. With the preceding.
365. *Veronica peregrina*, Linn. Fort Pierre.
366. *Geradia purpurea*, Linn. Council Bluffs.
367. *Castilleia sessiliflora*, Pursh. Common about Council Bluffs.
368. *Castilleia septentrionalis*, Lindl. Black Hills.
369. *Melampyrum americanum*, Michx. Extends up the Missouri as far as the mouth of the Platte.
370. *Dianthera americana*, Linn. Platte Valley.
371. *Verbena bracteosa*, Michx. A very common plant about prairie-dog villages on the Upper Missouri.
372. *Verbena hastata*, Linn. Platte Valley.
373. *Verbena stricta*, Vent. Platte Valley; July.
374. *Verbena aubletia*, Linn. Along the Missouri in Kansas.
375. *Lippia lanceolata*, Michx. Fort Leavenworth, Kansas Territory.
376. *Phryma leptostachya*, Linn. Not rare along the Missouri to latitude 43°.
377. *Mentha Canadensis*, Linn. Common in wet places, valley of the Missouri and Platte.
378. *Lycopus sinuatus*, Ell. Same as preceding.
379. *Monarda fistulosa*, Linn. Common along streams to mountains.
380. *Hedeoma hirta*, Nutt. Abundant in the prairie-dog villages, Upper Missouri.
381. *Blephilia ciliata*, Raf. Fort Pierre to Bad Lands.
382. *Lophanthus anisatus*, Benth. James River; on Missouri.

383. *Scutellaria parvula*, Michx. Council Bluffs.
384. *Tencrium Canadense*, Linn. Council Bluffs.
385. *Lithospermum canescens*, Lehm. High prairies, Council Bluffs.
386. *Lithospermum latifolium*, Michx. Fort Pierre.
387. *Myosotis glomerata*, Nutt. On dry sterile hills, Fort Pierre, and Bad Lands.
388. *Onosmodium hispidum*, Michx. Prairies about Teton River; Fort Pierre.
389. *Mertensia Virginica*, D. C. Fort Pierre; in bloom April 20, 1855.
390. *Echinospermum patulum*, Lehm. Prairies about Fort Pierre.
391. *Echinospermum lappulum*, Lehm. Prairies about Fort Pierre.
392. *Hydrophyllum Virginicum*, Linn. Shady woods as high up the Missouri as mouth of White River, and in White River Valley. Most abundant in the Carboniferous limestone regions of Council Bluffs; April.
393. *Hydrophyllum macrophyllum*, Nutt. With preceding.
394. *Ellisia nyctelea*, Linn. About old houses and gardens to Big Sioux, and along old roads in prairie-dog villages on the Upper Missouri.
395. *Phacelia circinata*, Jacq. In Kansas; Dr. Cooper.
396. *Phlox divaricata*, Linn. Council Bluffs and Platte Valley.
397. *Collomia linearis*, Nutt. Common about Fort Pierre; Fort Union.
398. *Gilia longiflora*, Torr. In sand hills of Niobrara River.
399. *Ipomea leptophylla*, Torr. I have seen this plant in but one locality along the Missouri—Bear Creek, near "Bad Lands." But in the sand hills on Loup Fork, along the Niobrara, and around Fort Laramie, it is very abundant.
400. *Cuscuta glomerata*, Choisy. Abundant on sandy bottoms of Missouri.
401. *Solanum nigrum*, Michx. Not rare on the sandy bottoms of Missouri.
402. *Solanum triflorum*, Nutt. Very abundant in prairie-dog villages on Upper Missouri.
403. *Solanum Carolinense*, Linn. Along Missouri to Council Bluffs.
404. *Physalis lanceolata*, Michx. Sandy bottoms of Missouri to Fort Pierre.
405. *Physalis viscosa*, Linn. Sandy bottoms of Missouri to mountains.
406. *Androcera lobata*, Nutt. Very abundant about old trading-houses, along old roads, and in prairie-dog villages on Upper Missouri.
407. *Apocynum cannabinum*, Linn. Abundant on low bottoms of Missouri to mountains.
408. *Asclepias macranthera*, Torr. Not rare on the moist prairies of Upper Missouri, Loup Fork, Platte Valley; July 16.
409. *Asclepias incarnata*, Linn. Moist places, Loup Fork, Platte.
410. *Asclepias tuberosa*, Linn. Mouth Big Sioux and in Platte Valley.
411. *Asclepias verticellata*, Linn. Abundant on prairies; Fort Pierre.
412. *Anantherix viridis*, Nutt. Platte Valley; Loup Fork; July 16.
413. *Acerates longifolia*, Nutt. Common around Fort Pierre.
414. *Acerates angustifolia*, Nutt. With preceding.
415. *Fraxinus Americana*, Linn. Generally diffused.
416. *Asarum Canadense*, Linn. Near Council Bluffs.
417. *Oxybaphus angustifolius*, Torr. Dry hills around Fort Pierre.
418. *Chenopodium album*, Linn. Platte Valley; Fort Pierre.
419. *Obione canescens*, Moq. "Bad Lands;" common.
420. *Salicornia herbacea*, Linn. Saline places; Fort Union.

421. *Sarcobatus vermicularis*, Nees. This is one of the most abundant shrubs on the Upper Missouri. It makes its first appearance near latitude 44°, and seems to thrive best in the saline clays of the Cretaceous and Tertiary formations. It is sometimes called "greasewood" by the traders, and is often used for fuel by them on the Yellowstone River, where it grows to the height of ten or twelve feet, with trunks two to three inches in diameter. On the Yellowstone and along the Missouri it sometimes covers many square miles to the exclusion of other plants.
422. *Amaranthus albus*, Linn. Sandy bottoms and shores of Missouri.
423. *Rumex persicarioides*, Linn. Sandy bottoms of Missouri.
424. *Rumex venosus*, Pursh. Old Ponca village; Loup Fork.
425. *Polygonum amphibium*, Linn. Low wet places along Missouri.
426. *Polygonum aviculare*, Linn. Council Bluffs along Missouri.
427. *Polygonum tenue*, Michx. Council Bluffs to mountains.
428. *Benzoin odoriferum*, Nees. Woody bottoms along Missouri, below Niobrara.
429. *Shepherdia argentea*, Nutt. Very abundant from mouth of Big Sioux River to the mountains. It bears a profusion of red acid fruit, called buffalo berries.
430. *Eleagnus argentea*, Pursh. I have seen this shrub in but one locality in Missouri, near Fort Clark, on the high Tertiary hills.
431. *Comandra umbellata*, Nutt. Fort Pierre and on the Yellowstone.
432. *Euphorbia corallata*, Linn. Quite common on Missouri to latitude 45°.
433. *Euphorbia marginata*, Pursh. Very abundant to mountains.
434. *Euphorbia maculata*, Linn. Same as last.
435. *Euphorbia polygonifolia*, Linn. Along old roads, Upper Missouri.
436. *Ulmus fulva*, Michx. Abundant on the rich bottoms of Missouri to Big Sioux, and ceases to appear at the mouth of Niobrara River.
437. *Ulmus Americanus*, Linn. Along rivers and streams to mountains.
438. *Celtis occidentalis*, Linn. Abundant near to Niobrara River.
439. *Morus rubra*, Linn. Very abundant to mouth of Big Sioux; seen sparingly and of small growth to the mountains.
440. *Urtica gracilis*, Ait. Thickets and streams to Niobrara.
441. *Urtica Canadensis*, Linn. Same as preceding.
442. *Parietaria Pennsylvanica*, Muhl. Missouri and Yellowstone.
443. *Humulus lupulus*, Linn. Most abundant in the Upper Missouri country.
444. *Platanus occidentalis*, Linn. Abundant on the rich bottoms of Missouri and Kansas; but ceases to appear about one hundred miles above Council Bluffs.
445. *Juglans cinerea*, Linn. Big Sioux.
446. *Juglans nigra*, Linn. Does not extend above latitude 43°.
447. *Quercus tinctoria*, Bartram. Council Bluffs and Big Sioux.
448. *Quercus rubra*, Linn. With preceding.
449. *Quercus macrocarpa*, Michx. Extends to mountains.
450. *Corylus Americana*, Walt. Abundant around Council Bluffs.
451. *Betula*. Black Hills.
452. *Alnus*. Black Hills.
453. *Populus tremuloides*, Michx. Black Hills.
454. *Populus angustifolia*, Torr.
455. *Populus monilifera*, Ait. A large tree, constituting by far the greater portion of the timber along the valley of Missouri.
456. *Salix*. Several species.
457. *Pinus ponderosa*, Douglass. Black Hills.

458. *Abies Douglassi.* Bad Lands of the Judith.
459. *Juniperus Virginiana*, Linn. Along Missouri to mountains.
460. *Arum triphyllum*, Torr. Low ponds to Big Sioux.
461. *Arum Dracontium*, Schott. Found by Dr. Cooper in Kansas.
462. *Typha latifolia*, Linn. Mouth of Platte.
463. *Sparganium ramosum*, Hudson. Low places to Fort Pierre.
464. *Lemna.* Common in ponds on Upper Missouri.
465. *Potamogeton natans*, Linn. White River Valley.
466. *Potamogeton pectinatus*, Linn. In ponds. Bad Lands.
467. *Alisma plantago*, Linn. Common in ponds, Upper Missouri.
468. *Sagittaria variabilis*, Engelmann. With preceding.
469. *Platanthera leucophea*, Nutt. Lower Platte.
470. *Spiranthes cernua*, Rich. Rich bottom prairies of Vermillion.
471. *Cypripedium pubescens*, Willd. Rocky banks to Big Sioux River.
472. *Cypripedium acaule*, Ait. With the preceding.
473. *Iris versicolor*, Linn. Lower Platte.
474. *Sisyrinchium anceps*, Linn. Bottom prairies to Fort Pierre.
475. *Hypoxis erecta*, Linn. Council Bluffs.
476. *Trillium sessile*, Willd. Extends to Big Sioux.
477. *Smilax herbacea*, Linn. Common. Mouth of Platte.
478. *Smilax rotundifolia*, Linn. Along Missouri to mouth of Platte.
479. *Smilacina stellata*, Desf. Very abundant to Niobrara, and occasionally seen to the mountains.
480. *Smilacina racemosa*, Desf. Council Bluffs.
481. *Polygonatum giganteum*, Dietrich. Council Bluffs.
482. *Allium Canadense*, Linn. Big Sioux.
483. *Allium reticulatum*, Nutt. Abundant about Fort Pierre.
484. *Allium stellatum*, Nutt. Platte and Loup Fork.
485. *Lillium canadense*, Linn. Big Sioux to Fort Pierre.
486. *Erythroninm americanum*, Smith. Council Bluffs.
487. *Erythronium albidum*, Nutt. Council Bluffs.
488. *Yucca angustifolia*, Sims. From the mouth of Niobrara River to mountains; on sterile hills.
489. *Streptopus amplexifolius*, D. C. Council Bluffs.
490. *Melanthium Virginicum*, Linn. Big Sioux.
491. *Juncus tenuis*, Willd. Abundant on bottoms of Missouri.
492. *Juncus polycephalus*, Michx. Bad Lands, &c.
493. *Tradescantia Virginica*, Linn. Sandy bottoms of Missouri and its tributaries; generally diffused.
494. *Scirpus.* Many species.

The Carices of the botanical collection were submitted to the distinguished botanist, Professor Chester Dewey, of the University of Rochester, New York, who is unquestionably the best living Caricographer in our country. Even now, at the advanced age of seventy-four years, his enthusiasm in his favorite departments of natural history continues unabated; and that his useful life may still be spared to us many years to come is the earnest desire of more than one young student of science who have been encouraged by his kind words and unselfish aid to seek a recognition in the scientific world. After a careful examination, the following catalogue and notes were received form Professor Dewey:

MY DEAR SIR: I inclose the list of all the Carices from Nebraka Territory that you placed in my hands for examination. The whole is a very interesting collection. I only wonder that, with your other

objects of special attention, you were able to seize upon so many of these sedges; and yet I know they are only a small portion of the plants you have thus preserved.

Wishing you all prosperity, and rejoicing in your perseverance and success, I am truly yours,

C. DEWEY.

Dr. F. V. HAYDEN.

LIST OF NEBRASKA CARICES.

495. *Carex straminea*, Willd. Above Fort Pierre.
var. *Minor*, Dew. Fort Pierre.
496. *Carex cristata*, Schm. Little Sioux River.
497. *Carex stipata*, Muhl. Little Sioux River.
498. *Carex vulpinoida*, Muhl. Common.
499. *Carex mirabilis*, Dew. Common.
500. *Carex cephaloidea*, Muhl. Near Fort Leavenworth.
501. *Carex scirpoides*, Schk. Near Fort Leavenworth.
502. *Carex festucacea*, Schk. Missouri, below Fort Pierre.
503. *Carex Muhlenburghii*, Schk. Missouri, below Fort Pierre.
504.* *Carex vulpina*, Linn. Large and fine. Missouri, below Fort Pierre.
505. *Carex tenera*, Dew. Missouri, below Fort Pierre.
506. *Carex hookeriana*, Dew. Missouri, below Fort Pierre.
507. *Carex rosea*, Schk. Southern Nebraska.
var. *radiata*, Dew. Southern Nebraska.
508. *Carex setacea*, Dew. Southern Nebraska.
509. *Carex teretiuscula*, Good. Southern Nebraska.
510. *Carex scoparia*, Schk. Common.
511.† *Carex petasata*, Dew. Upper Missouri.
512.‡ *Carex stenophylla*, Wahl. Upper Missouri.
513. *Carex festiva?*, Dew. (Too old to decide.) Near Fort Leavenworth.
514.§ *Carex Douglasii*, Boott. Before credited to arctic regions.
515. *Carex leporina*, Linn. Before credited to arctic regions.
516. *Carex obtusata*, Lily. Upper Missouri.
517. *Carex blanda*, Dew. Near Fort Clark.
518. *Carex anceps*, Schk. Near Fort Clark.
519. *Carex hystericina*, Wild. Eagle-nest Creek.
520. *Carex grisea*, Wahl. Near Fort Leavenworth.
521. *Carex marginata*, Muhl. Missouri, near Fort Pierre.
522. *Carex arctata*, Boott. Missouri, near Fort Pierre.
523. *Carex crauei*, Dew. Missouri River.
524. *Carex steudelli*, Kth. Missouri River.
525. *Carex moodii*, Dew. Missouri River.
526. *Carex eburnea*, Boott. Missouri River.
527. *Carex lanuginosa*, Michx. Yellowstone, &c.

NOTES BY PROF. DEWEY.

* *C. vulpina*, Linn. First found in our country in Ohio, several years since, and cannot be confounded with *C. stipata*, Muhl. It seems to abound in Nebraska, large and fine.

† *C. petasata*, Dew. Collected first in Arctic America, and is abundant in Nebraska.

‡ *C. stenophylla*, Wahl. A northern carex in Europe, and first published by Dr. Boott among the "Carices of British North America" as common there, and is abundant in Nebraska.

§ *C. Douglassi*, Boott. First described in Dr. Boott's work, just mentioned, but now ound in Nebraska, which seems to have strayed, like *C. Richardsoni*, into our latitude.

528. *Carex aristata*, K. Br. "Bad Lands."
var. *longo-lanceolata*, Dew. "Bad Lands."
529. *Carex riparia*, Good. Along Missouri.
530. *Carex trichocarpa*, Muhl. Along Missouri.
531. *Carex vesicaria*, Linn. Along Missouri.
532. *Carex longirostris*, Torr. Along Missouri.
533. *Carex filiformis*, Good. Eagle-nest Creek.
534. *Carex acuta*, Linn. Eagle-nest Creek.
535. *Carex vulgaris*, Fries. Eagle-nest Creek.
536. *Carex stricta*, Lam. Eagle-nest Creek.
537. *Carex strictior*, Dew. Eagle-nest Creek.
538. *Carex recta*, Boott. Near Fort Pierre.
539. *Carex davisii*, Torr. Yellowstone River.
540. *Carex shortiana*, Dew. Along Missouri.
541. *Carex ampullacea*, Good. Along Missouri.
542. *Carex monile*, Tuckerman. Along Missouri.
543. *Carex curta*, Good. Yellowstone River.
544. *Carex lacustris*, Willd.

The following species seem to be new:

545. *Carex Nebrascensis*, Dew. Missouri River, near Fort Pierre.
546. *Carex Haydeni*, Dew. Missouri River, near Fort Pierre.
547. *Carex Meekii*, Dew. Yellowstone River.
548. *Carex leavi-conica*, Dew. Yellowstone River.
549. *Zizania aquatica*, Linn. Along Missouri, wet ponds near Council Bluffs.
550. *Alopecurus geniculatus*, Linn. Near low wet spots on Missouri, near Big Sioux and mouth of Loup Fork.
551. *Vilfa cuspidata*, Torr. Along Missouri River; also on high hills along White River.
552. *Sporobalus heterolepis*, Gray. Along Shyenne River in Missouri.
553. *Agrostis michauxiana*, Torr. Bottoms of Kansas, also on James and Shyenne Rivers, Upper Missouri.
554. *Agrostis cryptandra*, Torr. Banks of Little Sioux River.
555. *Muhlenbergia glomerata*, Linn. Abundant on prairies of Upper Missouri; wood-lands, &c.
556. *Calamagrostis Canadensis*, Beauv. Lower Missouri.
557. *Calamagrostis longifolia*, Henk. Sandy bottoms.
558. *Calamagrostis stricta*, Nutt. Along Missouri; moist places.
559. *Stipa spartea*, Linn. Prairies of Upper Missouri.
560. *Stipa capillata*, Linn.
561. *Stipa membranacea*, Pursh. Sandy banks of Shyenne River.
562. *Aristida pallens*, Nutt. Sterile hills along Missouri; also on the Platte.
563. *Spartina cynosuroides*, Willd. Low situations on Missouri.
564. *Bouteloua oligostachya*, Torr. Upland prairies of Missouri.
565. *Sesleria dactyloides*, Nutt. This is one of the most abundant as well as useful grasses on the Upper Missouri. It grows in low matted tufts, covering the prairies oftentimes for many miles, and furnishing a most nutritious and palatable food for the buffalo, deer, and other game; also for the horses of the Indian and *voyageur*.
566. *Festuca tenella*, Willd. Valley of the Missouri.
567. *Festuca nutans*, Willd. Along bottoms of Kansas.
568. *Kaleria cristata*, Linn.

569. *Eatonica Pennsylvanica.*
570. *Poa pratensis*, Linn.
571. *Poa annua*, Linn. Sandy bottoms along Missouri.
572. *Poa nervata*, Willd. On the Kansas.
573. *Poa nemoralis*, Linn. Shady woods and ravines on Missouri.
574. *Arundo phragmites.* Abundant in moist places around Council Bluffs.
575. *Elymus Canadensis*, Linn. Wooded banks to mountains.
576. *Bruchmannia cruciformis*, Jacq. A beautiful grass, growing in low moist places. I have not seen it above Fort Pierre.
577. *Uniola stricta*, Torr. Hills of the Upper Missouri.
578. *Uniola paniculata*, Linn. Near Fort Leavenworth, K. T.
579. *Triticum repens*, Linn. Abundant along Missouri River.
580. *Hordeum pratense.* Above Missouri River.
581. *Hordeum pusillum*, Nutt. Above Missouri River.
582. *Hordeum jubatum*, Ait. Above Missouri River.
583. *Aira latifolia.* Above Missouri River.
584. *Aira elongata.* Above Missouri River.
585. *Ceratochloa grandiflora.*
586. *Cenchrus tribuloides*, Linn. Very common in Kansas, and seen on sand bottoms in the valley of Yellowstone.
587. *Andropogon scoparius*, Michx. Sandy bottoms of Missouri.
588. *Eragrostis poaoides*, Beauv. Along sandy bottoms, Lower Missouri.
589. *Monroa squarrosa*, Torr. in Whipple's Report. Great Bend of the Upper Missouri.
590. *Equisetum arvense*, Linn. Sandy bottoms along Missouri.
591. *Equisetum hyemale*, Linn. Covers large areas on sandy bottoms of Missouri and tributaries.
592. *Adiantum pedatum*, Linn. Council Bluffs.
593. *Botrychium Virginicum*, Swartz. Mouth of the Platte.

☆U.S.GOVERNMENT PRINTING OFFICE: 1981--0-731-016

US Army Corps of Engineers
Office of the Chief of Engineers

EP 870-1-7
Oct. 1981