CHAPTER OF RESULTS.

Reasons for this Chapter—Humboldt : Extracts from Cosmos on Value of Surveys, and Volcanic Disturbances in Oregon, etc.—Aid rendered by Professors Torrey and Hall in Analysis of Collections, Botanical and Geological—Notes on Astronomical Observations by Professor Hubbard—Capitulation of Couenga—Completing Government Policy to Conquer and Conciliate.

WHEN I laid down for myself the plan on which this memoir should be written, I thought that I would not introduce anything relating to the scientific work of the several expeditions in which I had been engaged, but that I would give only the events and incidents that make up daily life; whether mine was for the time over uninhabited countries, where there was nature only to be described, or among men where nature and natural things were effaced, and only the acts of men toward each other in society, and their effects upon the common welfare were concerned. And I stated this in the scope of the work as the purpose with which I set out to travel again over the road of my life. But I had not advanced far, when I found that in this way I would leave unrecorded the efforts of many laborious days and nights, and that the great fields of the prairies would lose their true coloring and variety of attraction when I failed to individualize the flowers, so many of which have legends; and the rocks of the mountains would lose their interest and be trodden over with me as ordinary ground, without any particular interest to arrest attention. What they were, and what their uses were, and what their relations to other rocks in distant regions, would remain untold; and they would occur in the narrative as simply rocks, if they occurred at all. And in going over waste regions which were but little known, or not at all, to other parts where people get their knowledge by reading only, I found that it would be necessary to give the relative position to those other parts, and to say also what means I used to fix these positions. Then, the flower and the rock, with the fixed locality, would together tell their own useful story about soil and climate, and give valuable indications to men who travel for scientific knowledge, or to emigrants searching for new homes. And so these would, in travelling over the pages of the book, find a guide to show them the way to the objects they had in mind. A man reading to find something of interest in

his particular science would find, and perhaps have lively pleasure in finding, that in the central ridges of the Sierra Nevada is the same gray rock of which his house is built on the shore of the Atlantic. And, sitting in some English home, reading along simply for the pleasure of an imagined travel through distant scenes, another would be delighted to find on the plains of the San Joaquin the little golden violet—his Shakespeare's "Love-in-idleness"—or, on the foot-hills of the Sierra, in the shade of the evergreen oaks, little fields of the true English crimson-tipped daisy; and straightway home associations would cluster round the page. It is true that in the lapse of time the face of these regions has changed, but the change is only in degree.

And as in drawing together the materials for these volumes, I recalled to my mind the men who had been with me in the long journeys, I remembered also the men who had aided me in giving value to them; who had given me the benefit which came from years of study and laborious thought; and I found that I could not be satisfied to omit from the record the results, however small might be their contribution to knowledge. Though they were, in fact, only nurselings which, under the culture of other hands, have taken their full growth, still I am not willing to let pass out of sight and memory the results of years of labor under difficult circumstances, and which afterward had been made useful by the perfected knowledge of such men as Torrey and Hall, whose only reward was in the delight they found in extending the confines of knowledge, and in their feeling of satisfaction at the reciprocated pleasure this contribution would give to their *confrères* in other parts of the world. For the men of science are the true cosmopolitans.

So I may be pardoned if instead of some incidents, which indeed are only the ripple on the stream of events, I retract the promise I made at the outset, and give the closing pages of this volume to the useful results of the time, the record of which precedes and fills it.

And I do not like to call by the name of appendix that which is not an appendage, but the result of foregoing thought and effort, flowing from these and part of them as consequences, not appended to them. And that may certainly be called "a chapter of results," which contains as consequences the approbation of Humboldt; the Capitulation of Couenga, which completed the policy of the Government to "conquer and conciliate;" and the fruits of many days of labor and exposure which had well-nigh worn out, heart and body, the men who were striving to reach them.

Note at page 248 refers to this Extract.

[I had, later, much satisfaction in learning that my description of past volcanic action displayed over this region between the Rocky Mountains and Pacific Ocean, had attracted the interested attention of Humboldt. Because of this, and because of the interest to be found in the general

view which, in that connection, he gives of the western part of the continent, I subjoin here from the "Cosmos" the extract in which he makes these references, and in which also he anticipates the use which already has been made of the "great Columbia River" as a channel for commerce.

J. C. F.]

EXTRACT FROM HUMBOLDT'S COSMOS.

"Thus, though, previous to the commencement of the nineteenth century, not a single altitude had been barometrically taken in the whole of New Spain, the hypsometrical and, in most cases also astronomical observations for thirty-two places in the direction from north to south, in a zone of nearly sixteen and one-half degrees of latitude, between the town of Santa Fé and the capital of Mexico, have been accomplished. We thus see that the surface of the wide elevated plain of Mexico assumes an undulating form varying in the centre from 5,850 to 7,500 feet in height. The lowest portion of the road from Parras to Albuquerque is even one thousand and sixty-six feet higher than the highest point of Vesuvius.

"The great, though gentle, swelling of the soil, whose highest portion we have just surveyed, and which from south to north, from the tropical part to the parallels of 42° and 44°, so increases in extent from east to west that the Great Basin, westward of the great Salt Lake of the Mormons, has a diameter of upward of three hundred and forty geographical miles, with a mean elevation of nearly five thousand eight hundred feet, differs very considerably from the rampart-like mountain chains by which it is surmounted. Our knowledge of this configuration is one of the chief points of Frémont's great hypsometrical investigations in the years 1842 and 1844. This swelling of the soil belongs to a different epoch from that late upheaval which we call mountain chains and systems of varied direction. At the point where, about 32° latitude, the mountain mass of Chihuahua, according to the present settlement of the boundaries, enters the western territory of the United States (in the provinces taken from Mexico), it begins to bear the not very definite title of the Sierra Madre. A decided bifurcation, however, occurs in the neighborhood of Albuquerque, and at this bifurcation the western chain still maintains the general title of the Sierra Madre, while the eastern branch has received, from latitude 36° 10′ forward (a little to the north of Santa Fé), from American and English travellers, the equally ill-chosen, but now universally accepted, title of the Rocky Mountains. The two chains form a lengthened valley, in which Albuquerque, Santa Fé, and Taos lie, and through which the Rio Grande del Norte flows. In latitude 38½°, this valley is closed by a chain running east and west for the space of eighty-eight geographical miles, while the Rocky Mountains extend undivided in a meridional direction as far as latitude 41°. In this intermediate space rise somewhat to the east the Spanish Peaks, Pike's Peak (5,800 feet), which has been beautifully delin-

eated by Frémont, James' Peak (11,434 feet), and the three Park Mountains, all of which enclose three deep valleys, the lateral walls of which rise up, along with the eastern Long's Peak, or Big Horn, to a height of 9,060 and 11,191 feet. On the eastern boundary, between Middle and North Park, the mountain chain all at once changes its direction and runs, from latitude 40¼° to 44°, for a distance of about two hundred and sixty geographical miles, from southeast to northwest. In this intermediate space lie the South Pass (7,490 feet), and the famous Wind River Mountains, so singularly pointed, together with Frémont's Peak (latitude 43° 8′), which reaches the height of 13,567 feet. In the parallel of 44°, in the neighborhood of the Three Tetons, where the northwesterly direction ceases, the meridian direction of the Rocky Mountains begins again, and continues as far as Lewis and Clarke's Pass, which lies in latitude 47° 2′ and longitude 112° 9′ 30″. Even at this point, the chain of the Rocky Mountains maintains a considerable height (5,977 feet), but from the many deep riverbeds in the direction of Flathead River (Clarke's Fork), it soon decreases to a more regular level. Clarke's Fork and Lewis or Snake River, unite in forming the great Columbia River, which will one day prove an important channel for commerce.

"As in Bolivia, the eastern chain of the Andes furthest removed from the sea, that of Sorata (21,287 feet) and Illimani (21,148 feet), furnish no volcano now in a state of ignition, so also in the western part of the United States, the volcanic action on the coast chain of California and Oregon is at present very limited. The long chain of the Rocky Mountains, at a distance from the shores of the South Sea varying from four hundred and eighty to eight hundred geographical miles, without any trace of still existing volcanic action, nevertheless shows, like the eastern chain of Bolivia in the vale of Yucay, on both of its slopes, volcanic rock, extinct craters, and even lavas enclosing obsidian, and beds of scoriæ. In the chain of the Rocky Mountains which we have here geographically described in accordance with the admirable observations of Frémont, Emory, Abbot, Wislizenus, Dana, and Jules Marcou, the latter, a distinguished geologist, reckons three groups of old volcanic rock on the two slopes. For the earliest notices of the vulcanicity of this district we are also indebted to the investigations made by Frémont since the years 1842 and 1843." *

In the departments of geological and botanical science I submitted on my return from the expeditions all my specimens to Dr. John Torrey of New Jersey, and Dr. James Hall of New York, who kindly classified and arranged all that I had been able to preserve through the difficult transportation and accidents of travel. Both furnished me with full statements

* Humboldt's Cosmos, vol. v., pp. 410–415.

of the results of their examinations. To the aid given by the skill of Dr. Hall I am indebted for the discovery of an oolitic formation in the region west of the Rocky Mountains, which further examination may prove to assimilate the geology of the New to that of the Old World in a rare particular which had not before been discovered in either of the two Americas.

It will be noticed in the descriptions of the geological formations given by Dr. Hall that he considers the discovery of the coal and fossil ferns which I found in the ridge connecting the Utah or Bear River Mountains with the Wind River chain, to be of great economical importance, as indicating the wide extent of this modern coal period.*

SKETCH OF THE VEGETABLE AND GEOLOGICAL CHARACTER OF THE REGION COVERED BY THE FIRST REPORT.

The collection of plants submitted to me for examination, though made under unfavorable circumstances, is a very interesting contribution to North American botany. From the mouth of the Kansas River to the "Red Buttes," on the North Fork of the Platte, the transportation was effected in carts; but from that place to and from the mountains, the explorations were made on horseback, and by such rapid movements (which were necessary, in order to accomplish the objects of the expedition), that but little opportunity was afforded for collecting and drying botanical specimens. Besides, the party was in a savage and inhospitable country, sometimes annoyed by Indians, and frequently in great distress from want of provisions; from which circumstances, and the many pressing duties that constantly engaged the attention of the commander, he was not able to make so large a collection as he desired. To give some general idea of the country explored by Lieutenant Frémont, I recapitulate, from his report, a brief sketch of his route. The expedition left the mouth of the Kansas on June 10, 1842, and, proceeding up that river about one hundred miles, then continued its course generally along the "bottoms" of the Kansas tributaries, but sometimes passing over the upper prairies. The soil of the river bottoms is always rich, and generally well timbered; though the whole region is what is called a prairie country. The upper prairies are an immense deposit of sand and gravel, covered with a good, and, very generally, a rich soil. Along the road, on reaching the little stream called Sandy Creek (a tributary of the Kansas), the soil became more sandy. The rock-formations of this region are limestone and sandstone. The *Amorpha canescens* was the characteristic plant, it being in many places as abundant as the grass.

* [It will be remembered that I am writing of conditions as they were known to me more than forty years ago.]

Crossing over from the waters of the Kansas, Lieutenant Frémont arrived at the Great Platte, two hundred and ten miles from its juncture with the Missouri. The valley of this river, from its mouth to the great forks, is about four miles broad, and three hundred and fifteen miles long. It is rich, well timbered, and covered with luxuriant grasses. The purple *Liatris scariosa* and several *asters* were here conspicuous features of the vegetation. I was pleased to recognize among the specimens collected near the forks the fine large-flowered asclepias, that I described many years ago in my account of James' "Rocky Mountain Plants," under the name of *A. speciosa*, and which Mr. Geyer also found in Nicollet's expedition. It seems to be the plant subsequently described and figured by Sir W. Hooker, under the name of *A. Douglasii*. On the Lower Platte, and all the way to the Sweet Water, the showy *Cleome integrifolia* occurred in abundance. From the Forks to Laramie River, a distance of about two hundred miles, the country may be called a sandy one. The valley of the North Fork is without timber; but the grasses are fine, and the herbaceous plants abundant. On the return of the expedition in September, Lieutenant Frémont says the whole country resembled a vast garden; but the prevailing plants were two or three species of *helianthus* (sun-flower). Between the main forks of the Platte, from the junction, as high up as Laramie's Fork, the formation consisted of marl, a soft earthy limestone, and a granite sandstone. At the latter place that singular leguminous plant, the *Kentrophyta montana* of Nuttall was first seen, and then occurred at intervals to the Sweet Water River. Following up the North Fork, Lieutenant Frémont arrived at the mouth of the Sweet Water River, one of the head-waters of the Platte. Above Laramie's Fork to this place the soil is generally sandy. The rocks consist of limestone, with a variety of sandstones (yellow, gray, and red argillaceous), with compact gypsum of alabaster, and fine conglomerates.

The route along the North Fork of the Platte afforded some of the best plants in the collection. The *Senecio rapifolia*, Nutt., occurred in many places, quite to the Sweet Water; *Lippia* (*zapania*) *cuneifolia* (Torr. in James' "Plants," only known before from Dr. James' collection); *Cercocarpus parvifolius*, Nutt.; *Eriogonum parvifolium*, and *cœspitosum*, Nutt.; *Shepherdia argentea*, Nutt., and *Geranium Fremontii*, a new species (near the Red Buttes), were found in this part of the journey. In saline soils, on the Upper Platte, near the mouth of the Sweet Water, were collected several interesting CHENOPODIACEÆ. One of which was first discovered by Dr. James in Long's expedition; and although it was considered as a new genus, I did not describe it owing to the want of the ripe fruit. It is the plant doubtfully referred by Hooker, in his "Flora Boreali Americana," to Batis. He had seen the male flowers only. As it is certainly a new genus, I have dedicated it to the excellent commander of the expedition, as a well-merited compliment for the services he has rendered North American botany.

The Sweet Water Valley is a sandy plain, about one hundred and twenty miles long, and generally about five miles broad; bounded by ranges of granitic mountains, between which the valley formation consists, near the Devil's Gate, of a grayish micaceous sandstone, with marl and white clay. At the encampment of August 5th to 6th, there occurred a fine white argillaceous sandstone, a coarse sandstone or pudding-stone, and a white calcareous sandstone. A few miles to the west of that position, Lieutenant Frémont reached a point where the sandstone rested immediately upon the granite, which thenceforward, along his line of route, alternated with a compact mica slate.

Along the Sweet Water, many interesting plants were collected, as may be seen by an examination of the catalogue; I would, however, mention the curious *Œnothera Nuttallii*, Torr. and Gr.; *Eurotia lanata*, Mocq. (Diotis lanata, *Pursh.*), which seems to be distinct from *E. ceratoides; Thermopsis montana*, Nutt.; *Gilia pulchella*, Dougl.; *Senecio spartioides*, Torr. and Gr.; a new species, and four or five species of wild currants (*Ribes irriguum*, Dougl., etc.). Near the mouth of the Sweet Water was found the *Plantago eriophora*, Torr., a species first described in my Dr. James' "Rocky Mountain Plants." On the upper part, and near the dividing ridge, were collected several species of *castilleja; Pentstemon micrantha*, Nutt.; several *gentians;* the pretty little *Androsace occidentalis*, Nutt.; *Solidago incana*, Torr. and Gr., and two species of *eriogonum*, one of which was new.

On August 8th, the exploring party crossed the dividing ridge or pass, and found the soil of the plains at the foot of the mountains, on the western side, to be sandy. From Laramie's Fork to this point, different species of Artemisia were the prevailing and characteristic plants; occupying the place of the grasses, and filling the air with the odor of camphor and turpentine. Along Little Sandy, a tributary of the Colorado of the West, were collected a new species of *phaca* (*P. digitata*) and *Parnassia fimbriata*.

On the morning of August 10th they entered the defiles of the Wind River Mountains, a spur of the Rocky Mountains, or Northern Andes, and among which they spent about eight days. On the borders of a lake, embosomed in one of the defiles, were collected *Sedum rhodiola*, DC. (which had been found before, south of Kotzebue's Sound, only by Dr. James); *Senecio hydrophilus*, Nutt.; *Vaccinium uliginosum; Betula glandulosa*, and *B. occidentalis*, Hook.; *Eleagnus argentea*, and *Shepherdia Canadensis*. Some of the higher peaks of the Wind River Mountains rise one