

to obtain a practicable route as a connecting link between the New and Old Worlds. In regard to the communication with Yenisei, since Professor Nordenskjöld, for the first time reached that river in 1875, it has been annually visited by European vessels conveying European commodities to Siberia, and returning from thence loaded with Siberian products. The traffic to the Lena will probably be taken up by American traders; and the safety of the voyage there and back should be insured when a chart of the Siberian coast has been obtained, also by the employment of strong and swift steamers.

At St. Lawrence Bay we remained only till mid-day on the 21st of July, when we weighed anchor and steered over to the American side, where we anchored at Port Clarence. We remained there till the 26th, when we again crossed over to the Asiatic side, and anchored in Koyamak Bay. From thence we went on the 28th, to St. Lawrence Island, remaining there from the 31st of July till the 2d of August. We then steered for Behring Island, where we anchored at its south-west point on August 14. We found here a small village with a church, and twenty-five wooden houses built and owned by an American firm, Hutchinson, Kohl, Phillips & Co., who here, and on the neighboring islands, carry on seal fishing. The inhabitants of the island, consisting of a few Russian government officials, some employes of the company and natives of the Aleutian Islands, make in all about three hundred who reside in the village. There we received our first news from Europe through American newspapers, whereas the last were printed in San Francisco, in April, 1879, and brought from thence by one of the company's steamers. On the 19th of August we left Behring Island and set our course for Yokohama, where we arrived on the evening of the 2d of September.—*Blackwood's Magazine.*

THE SWEDISH ARCTIC EXPEDITION.

We gave an account last week of the arrival of the Swedish Arctic exploring vessel, the small steamer Vega, at the home port of Stockholm, and the reception of Professor Nordenskjöld and his companions by the King of Sweden and Norway. Our illustration of the festal illuminations there, from a sketch by a Swedish correspondent, will not, therefore demand a further explanation. It was late on the Saturday evening, the 24th April, when the Arctic voyagers and circumnavigators of Northern Asia, who had been away since July 4, 1878, landed at Stockholm. They were first welcomed by the municipal authorities, and were then, by the King's command, escorted to the Royal Palace, where his Majesty Oscar II. greeted them with the utmost cordiality. The next day being Sunday, there was a thanksgiving service for their safe return, in the Royal Chapel, after which the King went to visit the ship, and presented to each of her officers and crew a medal commemorative of her adventurous voyage. In the evening there was a banquet at the palace or castle, where his Majesty proposed the health of Professor Nordenskjöld, Captain Falander, and the other explorers, in a very animated speech. The beautiful scene of the harbor quays, and surrounding buildings of the city, with the many vessels, boats, and steam launches, lighted up by the illuminations and fireworks, is well shown in the view we have engraved. Our engraving opposite is from the *Illustrated London News*.

DISTRIBUTION OF LAKES IN THE UNITED STATES.

By Prof. JOHN LE CONTE.

THERE are numerous lacustrine basins to be found in the States bordering the Pacific Ocean. As in other regions of the globe, their distribution is determined by the configuration of land, or, more specifically, by the forms of the great hydrographic basins in the interior of the continent; hence some general idea of the topography of the western portions of the United States is an essential preliminary.

TOPOGRAPHY.

One of the grand topographical features of the two American continents is the system of mountains bordering on the Pacific Coast, extending from Cape Horn to the North Polar Sea. This vast system of mountain chains has been collectively designated by some geographers as the Cordilleras. Different portions of it have received special designations, as the Andes, in South America; the Sierra Madre, in Mexico; and the Rocky Mountains, the Sierra Nevada, and the Cascade Range, in the United States. This great mountain system, entering the United States from Mexico, rapidly widens and subdivides into a labyrinth of mountain ranges, the whole mass having a maximum width near the parallel of 39° or 40° of about 1,000 miles. According to Prof. J. D. Whitney, the whole area embraced within this mountainous belt is but little, if any, short of 1,000,000 of square miles. The enormous mass included within the extreme boundaries is of a somewhat lozenge-shape, the length of each side being about 600 or 800 miles; "is formed by the Sierra Nevada and the Cascade Range on the two westerly faces, and by the Rocky Mountains, with the Big Horn, Wind River, and Bitter Root ranges, on the two easterly faces." Between these two gigantic mountain systems lies the

GREAT INTERIOR PLATEAU.

which constitutes the great physical feature of our territory. The plateau thus inclosed has in its central section, from east to west, in the pathway along which civilization has advanced, an elevation of 3,000 to 7,000 feet, falling off to the north and to the south, and in the latter direction sinking more than 200 feet below the sea level. The drainage of this vast area is accomplished by three great rivers and their numerous tributaries, viz.: 1. The Columbia River in the North, discharging into the Pacific Ocean. 2. The Rio Colorado of the West, discharging into the Gulf of California. 3. And the Rio Grande del Norte, discharging into the Gulf of Mexico. That portion of this great plateau which has been designated the great interior basin is without outlet to the sea. The great plateau is traversed by various ranges of mountains, of which the Wahsatch, extending north and south through nearly 400 miles, is the most notable. Between the Wahsatch and the Rocky Mountains runs the Uintah Range, the only high and well-defined chain in the Cordillera having an east and west trend. It is likewise traversed by several subordinate ranges of considerable magnitude, and is diversified by innumerable spurs and ridges, transverse narrow valleys, and occasionally broad plains, the valleys being sometimes green, attractive, and refreshing, while the plains are always arid, repulsive, and desolate to the last degree.

It is evident that this portion of our territory lying between the lofty snow-clad Rocky Mountains on its eastern

margin and the Sierra Nevada Mountains on its western boundary, can receive but a scanty supply of moisture from the vapor-bearing winds coming from either the Atlantic Ocean and the Gulf of Mexico on the one hand or from the Pacific Ocean on the other. Many of the streams are largely supplied with water from the melting of the snows which crown the summits of the two great mountain boundaries. Many portions of these arid plains only need water to render them fruitful; in such cases, when irrigation is practicable, the seeming desert may be made to blossom.

GREAT BASIN.

The central portions of what we have designated as the great plateau is divided into two distinct regions by the Wahsatch range of mountains trending north and south near the eastern borders of the Great Salt Lake for about 400 miles, viz.: 1. The great plateau proper lying, at an elevation of about 7,000 feet above the sea level, between the Rocky Mountains on the east and the Wahsatch Mountains on the west. 2. The great basin lying, at an elevation of about 4,000 to 5,000 feet, between the Wahsatch range on the east and the Sierra Nevada on the west. The region occupied by the mountains bordering the great basin has no drainage into the sea; the streams that head in the mountains find their way into saline lakes, disappear in sinks, or are lost in the sands of the deserts, where their waters are evaporated.

The great basin region is subdivided by the Humboldt Mountains into two sub-basins, viz.: a. The Salt Lake Basin, in which lie Salt Lake, Utah Lake, and Sevier Lake. During glacial times there was a large expanse of fresh water in this basin; and, according to G. K. Gilbert, at some former period, the waters of this basin rose so high that they overflowed to the ocean through Red Rock Pass into the Snake and Columbia Rivers; at this epoch its water level was about 900 feet above the present level of the Great Salt Lake. b. The second sub-basin is the Humboldt Basin, which lies between the Humboldt range and the Sierra Nevada. A number of smaller lakes and sinks, such as Pyramid Lake, Humboldt Sink, Carson Lake, Walker's Lake, and others, which dot the surface of the State of Nevada; and likewise Mono and Owen's Lakes, in California, are included in the same general depression. The estimated area of these two interior basins, without outlet to the sea, is about 210,374 square miles.

GREAT CALIFORNIA VALLEY.

Every one is familiar with the fact of the existence in California of two great masses of mountains, one designated the Sierra Nevada, lying in the eastern portion of the State, and the other the Coast ranges, bordering on the sea near the western boundary. Between the parallels of 35° to 40° there is no difficulty in separating the Coast ranges from the Sierra Nevada.

The great California valley, composed of the Sacramento and the San Joaquin, varying in width from 40 to 60 miles, forms a striking feature in the topography, being walled in by the Sierra Nevada on the one hand and the Coast ranges on the other. The broad valley thus defined forms a complete separation of the two systems of mountain chains. But, if we go south or north of latitudes 35° and 40° respectively, the condition of things changes. In the neighborhood of the Tejon Pass, above latitude 35°, the ridges of the Sierra Nevada and Coast ranges come together, intercalate and become continuous, and topography alone, independently of geological considerations, affords no clew to where one ceases and the other begins. The same is the case with regard to these two mountain ranges north of the head of the Sacramento valley. North of Shasta City (latitude 40° 35') the ranges close in on all sides, and in the labyrinth of chains there is no possibility of preserving the distinction between the Sierra Nevada and the Coast ranges. Within these limits and along an axial line, having a direction of north, 31° west, extending for a distance of about 400 miles, the topographical features of California assume a grand simplicity.

Nearly parallel to each other we have: 1. The eastern slope of the Sierra Nevada extending into the State of Nevada. 2. The Sierra Nevada range of mountains. 3. The great valley of California. 4. The Coast ranges. Passing north of California into Oregon, we come, in latitude 43°, to two beautiful and fertile valleys of the Umpqua and Willamette, which here form almost as striking a separation between the Cascade Mountains on the east and the Coast range on the west as does the great California valley.

ARID REGIONS.

In the United States the regions of the great plains—the vast, treeless country that stretches away from the eastern base of the Rocky Mountains and the great plateaus and basins lying west of the same range of mountains—constitute the arid areas, where agricultural operations are impracticable without more or less irrigation. It has been estimated that this arid region is more than one-third of the entire area embraced in the United States. From actual surveys and careful estimates, it would seem that it will not be possible to redeem more than three per cent. by irrigation, when every brook, creek, and river is utilized. Less than four per cent. of the region can be said to be forest-clad. These forests are restricted to the sides of the high mountains, and extend over the more elevated foothills. This does not include large areas covered with a scanty growth of dwarf cedars and pines, useful for fuel, but of no value in mechanical industries. Over the remaining districts a large portion is covered with grasses and other plants, which may to some extent be utilized for pasturage. Small valleys lying along mountain streams will doubtless receive the most careful and elaborate culture, affording fertile grain fields, vineyards, orchards, and gardens. The mountains, hills, and plains will furnish nutritious but scant pasturage for herds and flocks, but, after all, the agricultural resources of this vast area must be very limited. Gold, silver, copper, iron, coal, salt, and many other minerals are found in abundance; so that the region will be chiefly valuable for its mineral wealth.

CAUSE OF ARIDITY.

The mechanical causes of all terrestrial currents of air or winds must be sought for in the disturbance of atmospheric equilibrium produced by the unequal distribution of solar heat over the surface of the globe. Solar heat must, therefore, be looked upon as the "primum mobile," which originates and keeps in continual action the agencies which perpetuate the atmospheric circulation. In other words, the action of solar heat, combined with the very important modification produced by the rotation of the earth upon its axis, affords a full and satisfactory explanation, at least in a general and comprehensive view of the great systems of winds. The

operation of this good physical cause necessitates the general prevalence of west winds near the surface of the earth in the temperate zones. The great water surfaces are the chief sources whence the largest supply of moisture in the form of aqueous vapor is derived. The winds are the chief mechanical agents by which these vapors wafted to distant points where they are condensed into rain or snow, dropping richness and fertility on our fields, and covering our hills and mountain slopes with vestments of verdure. The land is, directly or indirectly, the agent which brings about the condensation of aqueous vapor. It accomplishes this result, either (as in the case of winds carrying vapors up mountain slopes) by forcing the vapors into higher and colder regions, or by creating upward currents of air by the action of solar heat, and thus conveying the vapors aloft into the colder regions of the atmosphere. Thus, in a general sense the oceans, seas, and lakes, constitute a vast vapor furnishing apparatus, while the continents and islands constitute a huge condensing apparatus; between them a gigantic process of distillation is carried on, which waters the earth and clothes the land with vegetation. Moreover, it must not be forgotten that the great thermal influence emanating from the sun alone has the power of putting in motion this immense apparatus. For the western portions of our territory, the Pacific Ocean constitutes the great vapor furnishing surface; the prevailing west winds sweep the vapors upon the lands lying to the east of the ocean, and the mountain ranges furnish the condensing apparatus. It is evident, therefore, that all aqueous phenomena of the atmosphere, embracing fog, rain, and snow, may be rationally accounted for by attending to the three following considerations: (1) The position of bodies of water furnishing aqueous vapor of greater or less tension; the degree of tension having relation to the temperature of the water. (2) The direction of the prevailing winds sweeping the vapor to regions of condensation or otherwise. (3) The configuration of the adjacent and remote lands, in promoting or opposing the operation of causes producing condensation of the vapors.

APPLICATIONS.

These general physical principles are readily applied to the explanation of the aridity of the extensive areas lying east of the Sierra Nevada and Cascade mountains. Through the whole length of California the Sierra Nevada are lofty and continuous, presenting an almost unbroken chain, with an average elevation of about 10,000 feet. This "great sea wall" almost completely shuts off the moisture borne by the vapor-bearing west winds coming from the Pacific Ocean. The small amount of moisture that surmounts the lofty snow-clad crests of these mountains is barely sufficient to produce a scanty precipitation of rain and snow from December to May each year, during the winter season for the Coast ranges. Hence we find east of this huge wall through the central portion of the State of Nevada, from the mud lakes of the north through the Humboldt desert and the great Salt Valley, and on the south to Death Valley, in California, a region of extreme aridity and barrenness. Most of this vast area is dreary and desolate beyond conception, being nearly destitute of water and vegetation, fearfully hot in summer, and occasionally swept by terrible sand storms. North of latitude 41° the Cascade and other ranges constituting the continuation of the Sierra Nevada mountains, have a mean elevation of only about 7,000 feet; so that a somewhat larger supply of moisture from the Pacific Ocean reaches the plateaus and basins lying between them and the Rocky Mountains. It is principally for this reason that eastern portions of Washington Territory, and Oregon, and the whole of Idaho, although situated in northern extensions of the arid regions, receive a somewhat larger supply of rain than corresponding districts in Nevada and California.

It has already been remarked that there are unquestionable indications that in a former epoch a large portion of the great basin was covered with water. During the Champlain epoch these arid plains were covered with immense sheets of water, of which the existing saline lakes are the isolated residues. Hence it follows that the extreme dryness of climate now existing in these regions did not always prevail. Since the above-mentioned geological epoch there has been an increasing dryness of climate over the whole of the great basin. Is it still progressing, or has it reached its maximum of aridity? Is the great cycle of humidity returning upon these desert plains, and will they once more be clothed with vegetation at some future period? These are important questions in relation to the future of the Pacific States.

There are certainly many evidences that during the past 25 years there has been a decided increase of rainfall and snowfall over a large portion of the great basin. Great Salt Lake is known to have risen 14 feet within the last 25 years, thereby submerging large tracts of land on its flat margins; and chemical analyses show that its waters are progressively freshening. According to the observations of Clarence King, during only four years (1867-71) Pyramid Lake has risen nine feet, and Winnemucca Lake 22 feet within the same short period. In like manner Mono Lake has risen 10 or 12 feet during the last 15 years. The same is said to be true of Walker's Lake and of Owen's Lake. Additional evidence of the increasing snowfall in the Sierra Nevada is afforded by the fact that the glacial masses, which cover the flanks of its lofty mountain peaks, seem to be advancing on the foothills. It would seem, therefore, that the rise of the lakes occupying the great basin is undoubtedly the result of a climatic cycle.

The momentous question for the future prosperity of the Pacific States is whether the cycle is to be a long or short one; whether it is to be a geological cycle of augmenting rainfall and snowfall constituting a secular change of climate, or whether it is to be only a climatic fluctuation of such short duration as to exercise no appreciable influence or development of the vegetable and animal kingdoms.

This vital question cannot, from the want of sufficient data, be answered at the present time. Our successors will, without doubt, be able after the lapse of sufficient time to accumulate accurately-observed facts numerous enough to warrant the deduction of trustworthy conclusions.—*Mining and Scientific Press.*

This *Family Herald* not long ago produced the following extraordinary statement: "It is not generally known that indigo is *exceedingly poisonous*." We certainly never met with a blue-dyer who had felt any inconvenience from daily contact with this excessively poisonous ware. It is also surprising, if the opinion of our worthy contemporary is correct, that the authorities, both in France and Germany, acting upon the best scientific advice, mention indigo and its solutions among the colors which may be lawfully used for sweetmeats.

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