

Notre Dame Law School

NDLScholarship

1883–1919: William J. Hoynes

Law School Deans

1885

The Country West of the Mississippi River

William J. Hoynes

Univeristy of Notre Dame

Follow this and additional works at: <https://scholarship.law.nd.edu/wjhoynes>



Part of the [Law Commons](#)

Recommended Citation

Hoynes, William J., "The Country West of the Mississippi River" (1885). *1883–1919: William J. Hoynes*. 15.

<https://scholarship.law.nd.edu/wjhoynes/15>

This Lecture is brought to you for free and open access by the Law School Deans at NDLScholarship. It has been accepted for inclusion in 1883–1919: William J. Hoynes by an authorized administrator of NDLScholarship. For more information, please contact lawdr@nd.edu.



UNIVERSITY OF NOTRE DAME ARCHIVES

DIGITAL COLLECTIONS

Extracted from the digital edition of *Scholastic*, <http://www.archives.nd.edu/Scholastic/>, October 29, 2014.

THE NOTRE DAME SCHOLASTIC.



VOL. XVIII.

NOTRE DAME, INDIANA, APRIL 25, 1885.

No. 33.

A Dedication.

BY C. T. U.

Dear friend of mine, I send to you
This rosary of rose and rue,
More rue than rose—I know not why,
Save that the joy-bird soars so high—
Heart-skies are oftener gray than blue.

In sheltered dale these blossoms grew,
And some had only tears for dew;
Perhaps they will not dim *your* eye,
Dear friend of mine.

And yet a little sunshine, too,
Among the cypress leaves I strew,
And forth they go—content am I
To know that in the days gone by,
Your lips have praised their form and hue,
Dear friend of mine.

The Country West of the Mississippi River.*

West of the Mississippi River lies the larger portion of our country. Its measurement from east to west is about 2,200 miles, while from north to south it is from 1,000 to 1,200 miles. A large part of it was acquired by purchase from France; the region bordering upon Mexico was acquired by annexation, cession and purchase from that country, and the extensive area west of the main range of the Rocky Mountains in the northwest was acquired by exploration and settlement.

THE TERRITORY OF LOUISIANA

was purchased from France in 1803. It included Louisiana, Arkansas, Indian Territory, Missouri, Kansas, Iowa, Nebraska, Minnesota, Dakota, Montana, Wyoming, and about half of Colorado. Strictly speaking, an exception should be made as to small tracts on the west borders of Montana, Wyoming, Kansas, and Indian Territory, but they are so inconsiderable that it is hardly worth while to refer specially to them. The consideration paid for that vast territory was only \$15,000,000. Thomas Jefferson, who was President in 1803, strongly advocated its purchase. It was feared

that, should France undertake to retain it, the British would manage in some way, their superior naval strength greatly aiding them, to conquer and acquire possession of it. Thus they could secure virtual control of the Mississippi River, and menace the material interests of the young Republic, if not its liberties. At any rate, its growth would thereby be checked and the development of its resources greatly retarded. Napoleon Bonaparte, whose star was even then in the ascendant, shared the popular apprehension that the British would take advantage of the first plausible pretext to invade and conquer the Territory of Louisiana. Very naturally, therefore, he wanted France to get rid of it in some voluntary way, and strongly advocated its sale. He believed it to be much wiser to sell it for \$15,000,000 than to run the risk of losing it by war. He saw that to keep it garrisoned with a force sufficiently strong to repel a British fleet and army would greatly weaken France. He knew that to sell it would be proper and honorable enough, as viewed from the standpoint of national dignity, while to lose it by war would be humiliating in the extreme. Besides, the money was greatly needed in France in connection with the schemes of war and conquest which Napoleon had in contemplation. In view of these facts, it is hardly necessary to add that but little difficulty was encountered in agreeing upon terms and perfecting the sale.

Few emigrants, however, settled in that region before 1830, and the scattering towns and settlements in it were confined to a narrow strip bordering upon the Mississippi. In fact, until 1845-6, or about the time of

THE MEXICAN WAR

the increase of population was very gradual and the development of the country extremely slow. Until that time the remote interior was regarded as a great desert and unfit for any use. Numbers of Americans had, however, settled in the eastern and western parts of Northern Mexico, and about the time mentioned they became very restless. Some of them went so far as to take up arms against the Mexican government. These acts were so flagrant and defiant that the authorities felt constrained to resort to extreme measures to suppress them. Serious conflicts ensued, and these were made a pretext for beginning the Mexican war. While the alleged wrongs inflicted upon the Americans were the special subject of con-

* Lecture delivered April 18th by Prof. WILLIAM HOYNES, A. M.

trovery and the ostensible cause of the war, it was nevertheless very plausibly suspected that the desire to acquire additional territory was the real cause. At any rate, it was a strong motive. The President himself, James K. Polk, began the war by sending the army to Mexico. Had he complied with the provisions of the Constitution, he would have sent his message to Congress, the war making power, and referred the whole matter to that body, which was then in session. But the slave power was dominant at the time, and Mr. Polk was its obedient servant. Its adherents supposed that the acquisition of additional territory would strengthen it by affording room for expansion in a region remote from the disputed borders, where it met in irrepressible conflict and increasing hostility with the free-soil sentiment of the North. In the war Mexico was, of course, signally vanquished. The victory resulted in the annexation of Texas and the cession to the United States of the region embracing New Mexico, California, Nevada, Utah, most of Arizona, and the portion of Colorado lying south of the Arkansas River and west of the plains. However, to give the transaction a semblance of fairness, it was agreed to pay Mexico \$15,000,000 for the ceded territory. In 1853 the southern part of Arizona was purchased, the consideration being \$10,000,000. This is known as the "Gadsden Purchase," Gen. Gadsden, of South Carolina, having taken a conspicuous part in concluding the negotiation. Though all that region had been visited by Spaniards and occupied by numbers of zealous missionaries long before the pilgrims landed at Plymouth Rock, yet the greater portion of it proved to be unavailable for permanent settlement and profitable cultivation by the whites, and the great majority of those living there at the time of the Mexican war were Indians.

In 1848 gold was discovered in California by a Mr. Sutter, and the wildest excitement was at once aroused. People flocked there from all parts of the world. Even Chinamen were among the immigrants, and within three or four years 20,000 of them were there. While most of the immigrants went to the "diggings" to engage in the search and scramble for gold, a fair proportion of them turned attention to speculation and trade. Wild and reckless, they formed a society altogether remarkable in its peculiarities, contrasts and paradoxes. Gold found in the "diggings" became plentiful, and the prices of all sorts of goods and services rose to fabulous figures. Quarter dollars were the smallest change in circulation, and no kind of service was rendered for less than a half dollar. Ordinary board cost from \$8 a day to \$30 a week. Pork was thought cheap at \$40 dollars a barrel, while flour sold for \$50. Boots sold at from \$30. to \$100 a pair. Laborers received \$1 an hour, and skilled mechanics had from \$12 to \$20 a day. Lumber sold for \$500 per M. A two-story frame building called the "Parker House," in San Francisco, rented for \$120,000 a year. The Government paid a rental of \$7,000 a month for a custom-house. A tent known as the "El Dorado," which was used for gambling and

saloon purposes, rented for \$40,000 a year. Speculation and gambling became a passion, and it was not unusual to stake as high as \$5,000 or \$10,000 on the turn of a card. The prices of real estate rose enormously, and the annual interest on money was greater than the principal. That abnormal state of things very naturally attracted large numbers of outlaws, and crimes in the forms of robbery, burglary, incendiarism and murder, became alarmingly common. To meet that growing evil, vigilance committees were formed in San Francisco and several towns of the interior. These seized, tried, convicted and executed several notorious criminals, and banished many others whose crimes were less flagrant. Such radical measures had a salutary influence. The power of the lawless was broken, and thereafter the laws were enforced with due vigor and impartiality.

The extreme northwestern portion of the United States was acquired by

EXPLORATION AND SETTLEMENT.

In the summer of 1803, the President's private Secretary, Captain Meriwether Lewis, was chosen by Congress, at the suggestion of Mr. Jefferson, to command an exploring expedition which it was proposed to send from the Mississippi to the Pacific. Captain Wm. Clarke was selected to accompany and assist him. The party was composed of 30 persons. In the spring of 1804 it started, going by way of the Missouri River. About the middle of November, the following year, the men reached the mouth of the Columbia River, having travelled 4,000 miles. For more than four months they remained, as though held by some mysterious power of fascination, near the grand river and the vast ocean, and amid the dense forests and the towering mountains of that section. The 23d of March they started on the return trip. After encountering numerous perils and suffering many privations they reached the Mississippi River on the 23d of September, 1806, having been absent on the journey of exploration for two years and four months. While they secured much information relative to the soil, climate and resources of the region through which they passed, yet it proved to be of very little practical utility to the public at large, as it did not reach many persons outside of official circles. The Government had no means at the time of publishing for general circulation documents containing such data, and, consequently, for years afterward the country beyond the Mississippi remained almost as obscure and unknown as it had previously been. The expedition commanded by Lewis and Clarke was the first ever sent by the Government to the region beyond the mountains, and most of the aborigines met on the route were awed and alarmed at the sight of white men, having never seen any before. Naturally and properly the territory traversed by the expedition was thereafter claimed as a part of the United States. But more than thirty years elapsed before people began to settle in it. During all that time very little attention was bestowed upon it. Then the Hudson Bay Company took possession of sev-

eral places on Puget Sound and the Columbia River and claimed the country tributary to them for Great Britain. British soldiers invaded it to make effective the claims of that powerful and aggressive Company. Our Government entered vigorous protest against the outrage, and a bitter controversy ensued. For a time it seemed as though war could not be averted. But, finally, as the result of mutual concessions, our right to the greater part of the disputed territory was acknowledged. By the treaty of 1846 the boundary line was fixed where it now is. In that way we acquired Idaho, Oregon and Washington Territory.

THE STATES

just west of the Mississippi compare favorably with those east of it in the qualities of fertile soil, varied resources, agreeable climate and general attractiveness. For more than 50 miles from the Gulf of Mexico Louisiana is practically uninhabitable. The ground is low, flat, covered with reeds, and subject to inundation. It is uninhabited, except by a few fishermen and pilots, who live at the mouth of the Mississippi. About 75 miles north of the Gulf, or 35 miles south of New Orleans, plantations come into view. Some of these rank as the most productive and beautiful in the State. In numerous places the ground is considerably lower than the level of the river, but it is protected from inundation by embankments or levees. These line all the low places and there constitute the banks of the river. They average 10 or 12 feet in height and about 20 in width. To the west the land gradually rises, but there are no noteworthy hills or bluffs, not to mention higher elevations or mountains, in the State. The common varieties of hard timber grow in abundance on the low lands near the Mississippi. In the western part of the State the soil is thin and poor. Near the Texas line are extensive forests of pine timber. They extend about 100 miles into Texas, and the State is very thinly settled for that distance. The soil in portions of Northern Texas, Southern Arkansas and Northwestern Louisiana is of a reddish hue, and Red River owes its color and name to that fact. The coloring properties of the soil impart a reddish tinge to the water. The chief products are cotton, sugar, tobacco, rice, fruits, and early vegetables for the northern markets.

Though there is a sparseness of population all through Arkansas, the southern part of the State is particularly backward in that respect. This section is well timbered and sufficiently watered, but the soil seems to be below average in fertility. It is more productive, however, along the Arkansas and the White River. North of the Arkansas it seems to be better, richer, and more productive than south of it. Along the Mississippi the ground is very low and subject to inundation. But two or three small towns or settlements can be seen from the Mississippi along the entire length of the State. There is hardly a break in the monotony of tall willows and small trees that line the river for 300 miles or more and extend back 20 or 30 miles before reaching land high enough for cultivation.

The northwestern part of the State is mountainous. There and in Southwestern Missouri are the Boston and Ozark Mountains, which have an altitude of from 2,000 to 3,000 feet above the level of the sea. A large portion of Arkansas is covered with forests of hard timber. Less than a fourth of the land is under cultivation. Many of the people, particularly those living in the northwestern part of the State, are very primitive in their appearance and manners. They wear home-spun clothes, hardly ever make the acquaintance of schoolmasters, live in log houses, have old-time hearths and chimneys instead of stoves, subsist mainly on corn bread and pork, frequently live almost exclusively upon what they raise on their farms, and cultivate their farms in total ignorance of improved agricultural machinery. But in much the same manner live the people of isolated localities among the mountains of Kentucky and Tennessee. As a rule, the women busily and deftly use the antiquated spinning-wheel, and make the clothes needed by themselves and their families. They are blissfully ignorant of the fashions, and even new bonnets appear to have no particular charms for them. Old-fashioned sun-bonnets that totally conceal the head and face, and extend a foot or two beyond, seem to meet the requirements of their Arcadian simplicity. Some of them were never more than 25 or 30 miles from the places where they were born.

Missouri is more populous than Arkansas and exhibits a greater variety of cultivable soil and resources. It is divided into two parts by the Missouri River. The most fertile lands are generally admitted to be north of the river, although throughout the State the soil is rich and productive in a high degree. In the southeast the ground is low and swampy, while in the southwest it is just the contrary, being hilly and mountainous. Cotton, tobacco, wheat, corn, oats, fruits, etc., are the principal productions. Timber is in abundant supply.

Iowa stands eminent among the great States of the Mississippi Valley. While agriculture is the chief industry, there is no lack of thriving manufacturing centres, and coal-mining and stock-raising command a fair share of attention. Most of the land bordering upon the Mississippi is notably rolling or undulating, being broken into low hills or bluffs, with intervening valleys. The interior of the State consists mainly of high rolling prairie, and the soil is somewhat sandy. Timber is very scarce.

In Minnesota the scenery along the river becomes bolder. High bluffs are seldom out of sight. In several places these are strikingly picturesque, and their precipitous sides suggest the walls of ancient cities or the castellated ruins of the Rhine. There are many small lakes scattered throughout the State, and one of them is the source of the Mississippi. The atmosphere is bracing, the water clear and wholesome, and the climate noted for salubrity. Agriculture is the leading industry, but Minneapolis and two or three other points are famous manufacturing centres. The lumber business, too, is important. The soil is perhaps a trifle

thin and sandy, and in the central and western parts of the State timber is in scanty supply for fuel, fencing and building purposes. But, on the whole, Minnesota is a beautiful, healthful and prosperous State.

The country west of these States for 150 or 200 miles greatly resembles them in many respects. This is particularly true of the east half of Dakota; Nebraska, Kansas and Indian Territory. The land throughout that section is very productive. Agriculture is the chief industry. For 20 or 25 miles from the Missouri River the country is rolling or bluff, the rains and storms of countless ages having left on every side gulches and ravines, the trend of which is to the river. No better land can be found anywhere than is comprised in this extensive area. A strong and almost impervious sub-soil is found about two feet below the surface, and to it sinks the rain that percolates through the more sandy and porous soil above. For weeks the water may remain upon the sub-soil, and in periods of drought it returns to the surface and supplies a sufficiency of moisture to the roots of growing plants. Yet droughts are uncommon. Within the past 20 years, or since the cultivation of the land became general, the rainfall has almost doubled. One serious drawback, however, is the absence of growing timber. While it fringes the rivers, growing in narrow strips along their banks, yet it is seldom found through the interior, or away from the streams, except where artificially planted. It is commonly, too, of small size and of the softer varieties, as cotton-wood, maple, etc. As a rule, owing to the scarcity of timber, the farms are not fenced. As several farmers combine in a locality to employ a herder, who daily watches and takes care of their cattle, there is no absolute need of fencing the land. This arrangement greatly conduces to economy. Wheat, corn and vegetables are the principal products. The rivers, of which there are several, generally have a southeasterly direction. They are usually shallow and abound in quicksands, which so treacherously yield under the feet that it is extremely dangerous to attempt to ford them. Even cattle are sometimes swallowed up in that way and lost while attempting to cross them. The largest of the rivers are the Missouri, the Yellowstone, the Niobrara, the Republican, the Platte, the Kansas, the Arkansas and the Red. From the Missouri westward the land increases in elevation at the rate of ten feet to the mile. A careful observer may notice the gradual but steady rise. Two hundred miles west of the Missouri the elevation is 2,150 feet above the level of the sea, and at this or even a lower altitude travellers suffering from pulmonary ailments have frequently to stop over for a day or more in order to become accustomed to the atmospheric changes incident to the increase of elevation. A little further west the soil is too dry and the weather too cold for engaging profitably in agricultural pursuits, and the cultivation of the soil ceases. That state of things defines the western boundary of the agricultural area, and there begins the eastern boundary of

THE GREAT PLAINS.

In Dakota and Western Nebraska is the remarkable basin known as the "Bad Lands." Though difficult of access, it would well repay the scientific enthusiast to visit them. Composed of clay, sand, marl, etc., they cannot offer great resistance to the erosive action of the elements, and they have been cut by the rains and the winds into fantastic and grotesque shapes. In the distance they look like the chimneys, steeples, cupolas, towers, castles and walls of a great city fallen into decay and ruins. Great sand-hills abound all through that section, and alkali dust everywhere lies heavy upon the ground. No matter how warm the days may be on the plains, the nights are invariably cool. Stock-raising is the overshadowing industry. Hundreds of thousands of cattle there room at large and subsist all through the year on the short bunch or buffalo grass. The great range begins in Texas, in sight of the Gulf of Mexico, and extends as far north as the British Possessions. In width it averages about 300 miles, including some of the mountain ranges. By thousands the cattle are driven north from Texas every year and sold to dealers or their agents on the plains. These men brand the animals with certain letters or devices which are recognized as belonging to them and so recorded for public inspection in the proper offices. The cattle are then suffered to go at large, and for a year they roam where they will, although watched to some extent by the cow-boys in the owner's service. At the expiration of that time, or early in the summer, the general "round-up," as it is called, takes place. Then the cow-boys, who are commonly daring and reckless men, supply themselves with rations for several days, thoroughly arm themselves, mount their fleet ponies, and start in pursuit of the cattle. Ordinarily they scatter widely, going miles and miles apart, with a view to finding all the cattle having the brand of their employer and driving them to a previously designated centre. Whenever night overtakes them while engaged in this work they dismount, picket their horses, and go to sleep wherever they may be, in the midst of the awful solitude and desolation of the great plains. By means of the brand they identify the cattle they have a right to take. When the animals have been driven together, those fit for sale are selected and sent to market, while the others are branded anew and turned out upon the range for another year. All this land belongs to the public, excepting the alternate sections in vicinity of the railroads; which were given by Congress to aid in their construction, but the Government does not interfere with its use by the stock-men. The kind of grass growing there is commonly known as bunch or buffalo grass. It grows in small bunches which are far enough apart to leave the sand or alkali dust everywhere visible. All concur in pronouncing it very nutritious, and it cures without being cut. It is the only food the cattle have. They must subsist upon it or perish of starvation. There are no sheds or stables to shelter them from the storms of the summer or the blizzards of the winter. When ice

and snow cover the ground and the terrible blasts of Manitoba sweep along the plains, they instinctively seek shelter by getting into the ravines or hollows. When fatigue overcomes them, they lie down in the snow and seek rest. When the pangs of hunger become too great to be endured, they paw away the snow and perhaps find under it grass enough to maintain life. In severe winters many of them perish of cold and starvation. The poor creatures fare badly. Vast herds of them occupy the plains, the foot-hills and the mountains for 300 miles or more west of the area of agriculture and settlements. Through all that region, except within 50 or 60 miles of the mountains, there are no notable cities or towns. The stations named in railroad maps generally consist of two or three houses for the use of the operators and employes of the company. The most notable places near the mountains are Denver, Greeley, Cheyenne, Georgetown, Colorado Springs, Pueblo and Cañon City. Among the mountains are Santa Fé, Leadville, Gunnison, Rawlins, Helena, etc.

Twenty or thirty years ago the plains were covered with high grass, and over them wandered immense herds of buffaloes. Their chief route in going from the north to the south and returning from the south to the north, lay through Kansas, Nebraska and Dakota. But all this is changed. Years ago they disappeared. The few still living have fled to the mountains of Montana and the Wind River country. They were thinned out and killed to make a sportsman's holiday. They were wantonly and cruelly killed. Even travellers by the overland trains kept up a constant fusillade upon them from the windows and platforms of the cars, and those killed in that way were left to serve as food for the wolves and coyotes of the plains. Hunting parties followed and killed them as a pastime. These harmless animals had furnished the Indians with an unfailing supply of provisions for generations; but when the civilized Caucasians took possession of the country a few short years sufficed to destroy forever all the vast herds of buffaloes that roamed over the plains. They have gone, towns have been built upon their trails, and the high grass has been trampled down or eaten to the roots. No wonder the Indians opposed the invasion of their lands by the whites, for it invariably deprived them of the chief source of their support—the buffaloes, deer and game generally upon which they had been accustomed to live. About 30 years ago Gov. Stevens, of Washington Territory, described the plains as

"A level prairie where the horizon is as unbroken as that of a calm sea. Nor are other points of resemblance wanting. The long grass, in places unusually rank, bending gracefully to the passing breeze, as it sweeps along the plain, gives the idea of waves. The flowing outlines of the rolling prairies are broken only by small lakes and patches of timber."

But no longer is it so. No trees are visible, except where, in stunted growth, they fringe the rivers. No long or rank grasses wave to the passing breeze. Small lakes do not exist. Water is scarce and generally brackish. The awful desolation of the sea remains, but in vain does one look for

its beauties. The land is undulating, and its interminable elevations and depressions may well suggest the comparison of the sea. But one would almost as willingly be adrift on the sea as lost and alone in that awful waste, where nothing is visible but the sky above, the unproductive soil beneath, the rolling prairie in the horizon. No water in thirst, no food in hunger, no friendly hand to succor in distress, no tree to offer shelter from the rays of the sun or the blasts of the storm, no house or human being within a journey of days! How great the desolation! How awful the solitude!

(CONCLUSION NEXT WEEK.)

Continued on
page 551

Photography.*

Among the many scientific inventions of the nineteenth century, two deserve special prominence—photography and spectrum analysis. Both belong to the province of optics, and, at the same time, of chemistry. Although spectrum analysis has not as yet entered into the domain of practical life, photography has passed immediately into it, and spread over almost every branch of human effort and knowledge, and now there is scarcely a single field in the universe of visible phenomena where its productive influence is not felt.

It brings before us faithful pictures of remote regions, of strange forms of stratification, of animals and plants; it fixes the transient appearances of solar eclipses; it is of great utility to the astronomer and geographer; it registers the movements of the barometer and thermometer; it has found an alliance with porcelain painting, with lithography, metal and book typography; it makes the noblest works of art accessible to those of slender means. It may thus be compared to the art of printing, which confers the greatest benefit by multiplying the production of thought, for it conveys an analogous advantage by fixing and multiplying phenomena.

The first step towards the invention of photography was made in 1802, by Wedgwood and Davy. They placed flat bodies, such as leaves of plants, upon lunar caustic paper,—which is paper covered with a thin coating of nitrate of silver; light was thus kept from the superimposed parts of the paper, the underlying parts remained white, whilst the uncovered portions of the paper were blackened by the light; and thus was produced a white outline, or silhouette, of the superimposed objects upon a black ground. By this process, however, only flat bodies could be copied; and Wedgwood soon seized the idea whether it were not possible, by the help of light, to produce pictures of any bodies whatsoever on sensitized paper. He tried to effect this by the aid of an interesting optical instrument which had the property of projecting flat-shaded images of solid objects. This instrument is the camera obscura, the principle of which was first applied by Porta, the cele-

* Paper read before the Notre Dame Scientific Association by CHARLES F. PORTER.

THE NOTRE DAME SCHOLASTIC.

Disce quasi semper victurus; vive quasi cras moriturus.

VOL. XVIII.

NOTRE DAME, INDIANA, MAY 9, 1885.

No. 35.

Virgil's Complaint.

"Sic vos non vobis nidificatis aves."

Ye little birds, beneath whose feather'd breasts
The tiny eggs repose in covert warm;
Not for yourselves ye build the downy nests
Whereon ye brood in sunshine or in storm.
Not for yourselves, but for those errant thieves
Who come to snare you with false, flatt'ring words,
Stealing your young; till even the forest-leaves
Bewail your ruined hopes. Alas! poor birds!

"Sic vos non vobis fertis aratra boves!"

And ye, good oxen, smarting 'neath the stroke
Of ploughman's goad—your ancient stripes unhealed,
Not for yourselves ye bear the heavy yoke,
And drag its burden o'er the stony field;
Not for yourselves, but for that lordly clown
Whose spring-tide toil shall end in harvest-feasts;
Who, 'neath his vine and fig-tree shall sit down,
While ye bide comfortless. Alas! poor beasts!

"Sic vos non vobis mellificatis apes"

So, also, ye, O brown and golden bees!
Who sail among the flowers all day long;
Yours is no selfish life of sunny ease,
Culling of sweets with drowsy, careless song;
Ye gather honey for the hive, 'tis true,
But never for yourselves. Marauders seize
Your amber treasures born of light and dew;
And feed upon your fruits. Alas! poor bees!

"Sic ego feci et alter tulit honores"

Ah! even so, hath Fate decreed to me!
As birds have built their nests; as toiling beasts
Have borne the yoke for others; and the bee
Hath furnished forth for idlers golden feasts;
So have I labored with a fruitless pen:
For while I wrought a cruel Destiny
Compassed me round; my toil first mock'd and then
Mine honors stole, and gave to other men;—
Alas! poor bard! Alas! alas! poor me!

—E. C. DONNELLY, in *Monitor*.

The Afghan Question.

Slowly, but with unswerving constancy, for the last two centuries, the Muscovite Cabinet has pursued the project formed by Peter the Great—a project worthy his mighty genius. It is well known that the founder of the Russian Empire, after having forced Charles XII to sign an igno-

minious peace, had conceived the design of opening up to his subjects a route to the Indies by way of Persia. If he did not succeed in his expedition, he, at least, pointed out to his successors a way which they had only to follow in order one day to obtain their share of the wealth of Hindostan. His successors have not been forgetful of their ancestor's plan, and each of them has contributed his *brick* to the building of the edifice, which bids fair to be completed by the active exertions of the present Czar.

Russia is characteristically slow in its decisions. Its resolutions are rarely adopted with that lightning rapidity which creates astonishment. Its laws, like its glaciers, slow and laborious in their movements, are adapted to the clime. In its decrees all is measured, calculated, as in a chemical laboratory. Often long days elapse between the taking of a resolution and the executing of it. When the time of action comes, it is ready. The fortunes of war may baffle its well laid plans, but it is not discouraged. Often ahead of its time by half a century, it lies concealed from the public eye, but is constant to the end in its efforts which, sooner or later, are achieved.

Fifty years ago, the Cabinet of St. Petersburg—a cabinet of dim political vision, if you will,—cast its eyes towards the Indian Ocean. Lying intermediate it beheld a country inhabited by a number of tribes, some nomadic, some fixed, and, though submissive to the rule of the Emir of Caboul, all sons of Liberty; this country—Afghanistan—Russia determined to occupy at some future day.

Asiatic Russia and the territory of Afghanistan are inhabited by numerous independent tribes hostile to the Great Empire. These peoples are gradually being reduced to subjection: the work is slow but sure.

It is an interesting study to follow the Russian troops in their different expeditions across Central Asia; as far as the "Gate of the Indies," during the last forty years.

In 1839 a Russian army set out to begin the conquest of the country around Lake Aral. At that time the elements took upon themselves the office of defending the aboriginals. With the exception of a few stragglers who succeeded in making their way back home to announce the magnitude of the disaster, the rest of the army lay buried in the snow.

In 1846 another army started off for the same country to subdue the Kirghises, fierce Cossacks

rects all the actions of the government and protects the interests of the Mandarins; but when she speaks of the affection that the Afghans have for their protector, the words of a well-known statesman seem to be forgotten: "However disagreeable the avowal, there is no doubt that the Russians have the advantage, and one can easily prophesy they are to be the usurpers of India."

They have the prestige; they have made immense conquests in Asia since 1846; their armies are respected, nay, even welcomed, as the voluntary submission of the Turkomans proves. That they have the prestige, needs no further evidence. Besides, England forgets that it has wounded a nation whose love of liberty is second to none other, and whose vengeance is hereditary. A fact no less strange than unaccountable is, why did not England occupy Herat after Russia had taken possession of Sarach? That the Madhi was troublesome and prevented it from openly declaring war against Russia at the time, may, perhaps, have been the reason, but the more apparent one is that she preferred to conceal her policy and involve the Afghans in a war in which itself would take part as the champions of that liberty of which it had itself, in vain, attempted to rob them.

According to all appearances, Russia will not arrest its march on Herat. From Herat it sees Afghanistan: it must have there either a part of Hindostan or a port in the Gulf of Persia. Russia must have Afghanistan,—it is the well-spring of the Muscovites,—their treasury. The millions which will be spent in joining the line of the Caspian sea to the railroad north-east of the Indies will be quickly refunded, for the moment the work is finished, seventeen days will suffice to go from London to the Indies *via* Moscow, and Russia will be the great commercial route of the world.

M. R.

The Country West of the Mississippi River.

II.

The Rocky Mountains are about 500 miles west of the Missouri River, and the elevation of the plains at their base is from 5,000 to 6,000 feet above sea-level. On this account, the first appearance of the mountains is somewhat disappointing. Instead of beholding a great mountain chain that rises like a wall from the plains to an elevation of from 7,000 to 14,000 feet, a person sees an interminable line of high table-land, the average altitude of which is 2,000 feet above the plains, and from which isolated mountains and conspicuous peaks shoot up to heights varying from 1,000 to 7,000 feet. Though many of them are 14,000 feet above sea-level, yet half of the elevation is not apparent on account of the altitude of the plains and the higher level of the table-land which constitutes the average summit of the mountains. The loftier peaks can readily be seen at a distance of 100 or 125 miles. When first descried by persons approaching from the East they look like great masses of clouds lying along the horizon. Their sombre

base and snow-white crest seem only to heighten the illusion. The air is so dry, clear and crisp that the vision has a remarkable scope. Objects 100 miles away are supposed to be within less than half of that distance. In Colorado and Wyoming the Rocky Mountains have an average width of 500 miles. In Montana and further north they deflect obliquely toward the Pacific Ocean, and the range becomes considerably narrower. After passing the northern boundary of the United States it turns north again and continues almost undeviatingly in that direction till it sinks out of sight in the Arctic Ocean. West of it, between it and the ocean, lies the great basin of the Columbia River, and further south is the noted Salt Lake basin. The former is from 2,000 to 3,000 feet above sea-level, while the latter is about 2,000 feet higher. Between them is a more elevated region. Along the southern borders of Utah and Nevada, and extending into Arizona for 100 miles or more, is another high section. The average elevation is 6,500 feet above sea-level. Further south is the basin of the Gila River. This extends all the way from New Mexico to California, and the average altitude is less than 4,000 feet above sea-level. The great interior basin of Salt Lake is generally admitted to be the most barren and uninviting of the number. The cañons on the western slope of the mountains are well watered, have excellent soil, abound in minerals, and are supplied with sufficient timber for all practical purposes. But all the favored localities in that section have been taken by the Mormons, who there live, and cultivate their farms, and have their towns and industries. In some places Salt Lake is very near the Wasatch Mountains, which constitute a spur of the Rockies, while at other points it is 20 or 30 miles from them. Although five rivers flow into Salt Lake, yet there is no outlet from it. The superfluous water is evidently taken up into the dry air by evaporation. The lake is over 120 miles in length and about 50 in width. It is said that the proportion of salt in the water is so great that a pound of almost pure salt can be secured from the vaporization of less than two quarts of water. Fish cannot live in it, and it is so buoyant that anybody may swim and nobody need drown in it. West of the lake, or about 70 miles from the mountains, the scene changes, the perspective becomes less inviting, and a tract of desert, bleak and barren as Cobi or Sahara, opens upon the view. An extensive area, comprising miles upon miles of sand and alkali dust, appears. No tree, no shrub, no blade of grass there greets the vision. From it rise exhalations frequently irritating and painful to the throat, nostrils and eyes. No river, stream or rivulet runs through it. No living thing, not even the lowest forms of reptile life, can there be found. And poor and indifferent indeed must be the locality which rattlesnakes refuse to frequent in that region. Beyond this desert tract a slight improvement in the appearance of the country becomes visible. But the most notable kind of vegetation there and throughout the great basin is what is commonly known as grease-wood or sage-brush, or what is less com-

monly called *artemisia*. It is two or three feet in height and has a decidedly repulsive appearance. Grease seems to exude from it, and it is covered with a grayish alkali dust. In some places it spreads over the country for miles and miles, and lines the sides of the dry and dreary hills, growing even to the verge of barrenness near their very summits. West of Salt Lake the water is generally brackish and almost as unpalatable as lye. Everywhere, too, it is scarce. With the exception of Humboldt River and Sink, there is hardly any stream or body of water worthy of a distinctive name. There is no outlet from the basin to the ocean, and it is completely surrounded by mountains that rise from 1,200 to 3,000 feet above its general level. It is about 500 miles in length and 300 in width. It is supposed that an inland sea or great lake once covered it, and there is strong evidence of a geological nature to confirm the impression. The small streams that issue from some of the hills disappear altogether after flowing a few hundred yards. They sink into the parched soil and the burning sand. The annual rainfall is seldom more than four inches. Lightning and thunder are almost phenomenal, so seldom are they seen and heard. The sky is almost uninterruptedly clear and free from clouds. The golden glories of the sun fall upon this great basin on an average of 300 days or more each year; and at night the moon and the stars shine forth and scintillate in the heavens with a peculiar brightness and resplendence. At sunset flashes along the horizon the dying glory of the day—the luminous brightness of the departing sun—in bits, and banners, and streamers of fire and brightest coloring. There are but a few small towns in all that region. The houses are small, built of coarse boards, and generally unpainted. Hardly any of them are plastered. White sheets are ordinarily used in lieu of walls between the apartments. The inhabitants are chiefly railroad employes and persons who depend upon the meagre profits of trade with the few straggling mining camps in the interior. There are also a few Shoshone Indians in and around the towns, and it would be by no means an easy matter to ascertain or find some plausible explanation of how they do live. With the exception of these towns, the whole region is practically uninhabited. The lands are not cultivated, and no kind of agricultural industry thrives in it. For that matter it may be said that there are but few localities between the central part of the great plains and the Sierra Nevada Mountains—a distance of 1,300 miles—in which anything like special attention is bestowed upon the cultivation of the lands. And wherever they are cultivated, as in the immediate vicinity of the mountains, it is necessary to irrigate them. Otherwise they would produce nothing. Even the trees planted along the sides of the streets in Cheyenne, Denver, Georgetown, Pueblo, Laramie, Ogden, Salt Lake City, etc., must be irrigated. To that end, and with a view also to the maintenance of cleanliness and healthfulness, the persevering hand of industry has turned streams into the streets of all the cities of the plains and the moun-

tains. Through every street two streams usually flow, one being on each side. The water for this purpose is received in some instances through ditches from rivers or little lakes ten or twenty miles away. Among the mountains are numerous rivers and lakes at elevations of 6,000 and even 10,000 feet above sea-level.

THE MOUNTAIN TOWNS

are more numerous and populous than those of the plains east of Cheyenne, Denver, etc. The most noted place is Leadville, which had a population of 30,000 a few years ago. But when the excitement incident to the discovery of several rich silver mines in the vicinity subsided, its popularity suffered an ominous eclipse, and its population at present is less than 15,000. Mining is the chief industry of the mountains, although on the Laramie Plains and in some of the parks the cattle business has the lead. Some of these parks comprise hundreds and others thousands of square miles. They have the appearance of great depressions in the mountains, or, at any rate, the mountains tower above them on every side. Through them flow perennial streams and rippling brooks, the water of which is pure, clear and wholesome. Timber tracts and small prairies beautifully alternate. They afford excellent shelter to the numerous kinds of mountain game that seek and abound in them. The highest peaks in vicinity of the parks mark the line of the "Continental Divide." This is an imaginary line running along the summit of the mountains. It is the watershed of the continent, or the dividing line between the Atlantic and the Pacific Ocean. All the rivers, and streams, and rivulets that have their rise on the east side of this line flow to the east and ultimately enter the Gulf of Mexico and the Atlantic Ocean, while all that have their sources west of it flow to the Pacific, or into Salt Lake, or disappear altogether in the sands of the interior basin. The country east of the "Divide" is called the "Atlantic Slope," while that west of it is known as the "Pacific Slope." The average elevation of the mountains is about 7,500 feet above sea-level. In vicinity of the railroads, now numerous enough for all practical purposes, there are several towns which have become notable on account of their location, their industries, or the resources tributary to them. Their climate is generally much less severe than that of Leadville, which is built at an elevation of more than 10,000 feet above sea-level. But the inhabitants of that city above the clouds have at least one compensation for the rigors of the climate. Cats cannot live there! Though sage-brush—always indicative of a poor, dry, sandy, alkali-mixed soil—is very common on the mountains, yet there is no doubt that the land is much better and more productive than in the basin west of Salt Lake. Near Laramie City are great sulphur and lead deposits. At Carbon, coal of fair quality is found in abundance. Green River, 845 miles west of Omaha, must always be interesting to the geologist. The perpendicular bluffs known as the "Green River Shales" exhibit rocks of

different colors and different varieties in well marked strata, lying one above another, for several hundred feet. Toward the top clay and lime predominate, and then come boulders, pebbles and coarse sand. The river itself rises in the north-west part of the Wind River country. About 350 miles from its source it flows into the Colorado River, which drains and carries off to the Pacific most of the waters of the Rocky Mountains west of the "Divide." Green River runs for a considerable distance through a soil comprising decomposed rock, slate, etc., the color of which is ultra green, and they impart that color to the water. Hence, "Green River" is not a misnomer. Hiliard is noted for the thriving business there done in lumber, telegraph poles, railroad ties, etc. From the Uintah Mountains, 25 miles to the south, a great flume comes down to the town. It is made of planks spiked together in the form of a V, and practically water-tight. It slopes down from the mountains with due reference to uniformity of grade, being supported in the depressions and hollows by timbers properly placed under it. A stream on the mountain is brought to it by means of a ditch, and thus a rapid current of water from eighteen inches to three feet in depth is introduced into the flume. The lumber, ties, telegraph poles, cord-wood, etc., cut on the mountains are thrown into this flume, and away they are carried by the water at the rate of 15 or 20 miles an hour to the busy town 2,000 or 3,000 feet below. In referring to the Wasatch and Uintah Mountains it may be well, by way of explanation, to say that they belong to and are a part of the Rocky Mountains. The higher peaks and more noted spurs of the Rockies have distinctive names, as Pike's, Gray's and Long's Peak, the Elk and Sangre de Cristo Mountains, Mount Lincoln, Mount of the Holy Cross, Sheep Mountain, Black Hills of Wyoming, etc. These are not the celebrated Black Hills. The latter are an isolated group, and lie much further to the north-east, being on the boundary between Wyoming and Dakota. Among the objects seldom out of sight on the mountains are isolated masses of rock regular enough in outlines to resemble the walls, and columns, and steeples of vast cathedrals—so strongly suggestive of the comparison as to be called "Cathedral Rocks," "Church Buttes," etc. Rock formations of striking shapes and gigantic proportions; resembling in the distance lonely cemeteries, deserted cities, frowning fortresses, and the like, may be seen in many localities on the summit of the mountains. But on the western declivity, leading down into Salt Lake basin, these rock formations are most numerous, most varied, most grotesque. The descent begins a short distance west of Wasatch, which is almost midway between the Missouri River and the Pacific Ocean. There the traveller enters Echo Cañon, and as he follows its downward incline, he sees on his right a wall of red sandstone, the altitude of which is from 500 to 1,500 feet. In the distance it has the appearance of a line of castles, and is consequently called "Castle Rocks." Further on the cañon increases in perplexity, and its wonders become multiplied.

Awful chasms, great gorges, extensive sandstone formations, and rocks of various shapes, sizes and colors, come into view. The south side of the cañon is much tamer than the north, the mountain-sides being generally sloping and the snow-covered summits being the only redeeming feature of the scenery. On the north, walls of granite, and sandstone, and clay, and conglomerate, shoot up almost vertically in several places for hundreds and hundreds of feet. "Hanging Rock," "Steamboat Rock," "Pulpit Rock," "Witches' Cave," "Devil's Slide," etc., are among the specially striking objects seen in this interesting cañon. It joins and has its continuation in Weber Cañon, through which Weber River runs on its way to Salt Lake. These cañons have a combined length of 50 or 60 miles, and in that distance the decline in elevation is about 2,500 feet. The valleys in vicinity of Salt Lake are about 1,500 feet lower than the plains at the eastern base of the mountains. Though the lands have to be irrigated in both quarters, yet the Salt Lake region has a decided advantage in respect to fertility of soil, propitiousness of climate, and requisite supply of water and timber. All the ordinary agricultural products, including even corn, which needs a warm climate, grow there and flourish. The mountains shelter the valleys from the blizzards and severe storms of the north, but nevertheless, high winds are not uncommon. For three or four hours at a time these blow steadily, and sometimes furiously. Occasionally, they pick up sand and small pebbles, which they cast against whatever stands in the way with a degree of violence not unlike that attending the fall of hail. Most people feel constrained to seek indoor shelter from the pelting of these storms. After them vegetation looks scorched and withered, and so remains for several hours.

For 500 miles west of Salt Lake the country is mainly a desert. Mining is the chief industry, though for the last six or seven years even that has been extremely dull and unprofitable. But as this section has already been briefly described, it would hardly be proper to refer minutely to it again. In dismissing it from further consideration, it may be said that

THE SIERRA NEVADA MOUNTAINS

form its western boundary. Most grateful is the view of their pine-clad sides, rushing streams, crystal lakes, snow-filled gorges, granite peaks and towering summits, after the monotonous and fatiguing journey from Salt Lake. Their grandeur, their varied beauties, their exhilarating atmosphere infuse new life into the weary traveller. At their base the soil is comparatively rich and productive. Gardens and tracts of cultivated land are to be seen in the towns there situated. The most noted of these are Reno, Carson City, Gold Hill, Virginia City, etc. A few years ago these were famous in connection with the mining interests of the Pacific Slope. They were then teeming with life, but now they are comparatively deserted. The value of the precious metals annually sent from them to market was over \$25,000,000, but

now it is less than \$3,000,000. Business was at high tide, wages were good, every one willing to work was employed, and boundless prosperity seemed to prevail; but the volume of business has shrunk to a low ebb, wages are not relatively as remunerative as in the East, idleness is no longer an index of indolence, and prosperity has vanished, leaving only the exasperating relics of former favors. But up and across the mountains it is different, and the view is more animating. Signs of life, activity and enterprise there multiply. Woodchoppers are busy even on the higher levels. Sawmills are in operation at several points, especially along the Truckee River. The dairy business is conducted on an extensive scale, the mountain towns and San Francisco affording a reliable market. Numerous V-flumes descend from the higher elevations miles and miles away, where the woodchoppers are at work. They serve as conduits for several mountain streams, the water of which runs in them with great velocity and carries down to the railroad immense quantities of railroad ties, cordwood, telegraph poles, lumber, etc. Vast piles of lumber indicate clearly enough the chief industry of Boca and Truckee, which are thriving places high up in the mountains. The steep roofs of the houses in these places suggest how deep the snow falls. Were they flat enough to retain it as it falls they would doubtless be crushed and destroyed. The inhabitants insist that the snow sometimes comes down upon them at the rate of a foot an hour. It was in this section, or near Donner Lake, two miles distant, that the Donner party perished of cold and starvation in 1846-7, being hemmed in for months by snow ranging from 12 to 20 feet in depth. Twelve miles south of Truckee is the beautiful sheet of water known as Lake Tahoe. It lies on the boundary between Nevada and California. Measurements indicate that it has a depth of 1,700 in at least one or two places. Though the water is clear and beautiful, it is said that it is singularly lacking in buoyancy, and that the heavier kinds of wood at once sink in it. In the summer it is a favorite resort for tourists from distant parts of California and even the East. Its elevation above sea-level is about 6,000 feet. A short distance west of Truckee begin the famous snow-sheds of the Sierras. They have in the aggregate a length of 45 or 50 miles. One of them is so long that a train may proceed in it at the regular speed for an hour or more before reaching the end. They are constructed of heavy timbers, and are not unlike a great tunnel, although better lighted.

(CONCLUSION NEXT WEEK.) Continued on
page 566

THE poet Longfellow has paid the following beautiful tribute to the Blessed Virgin Mary:

"And if our faith had given us nothing more
Than this example of all womanhood;
So mild, so merciful, so strong, so good,
So patient, peaceful, loyal, loving, pure,
This were enough to prove it higher and true
Than all the creeds the world had known before."

Light.*

A satisfactory definition of light has not, and probably never will be, given. Two theories have existed concerning it, one of which is at present rejected by scientific men. However, it is necessary for the proper treatment of our subject that we should consider the main points of each.

The first is the Emission or Corpuscular theory, the principal defenders of which were Newton, Biot, Laplace, Malot, and Brewster. It supposes that light consists of small particles, emitted, with inconceivable velocity, by luminous bodies, and fine enough to pass through the pores of transparent media. Considering the velocity of light, which is generally supposed to be 192,500 miles a second, these particles, if they exist, must be infinitesimally small; for if they had the least conceivable weight they would destroy so delicate an organ as the eye. This is one of the principal objections to the emission theory, but a more formidable one has been made. In direct reflection, according to this theory, the light particles are first of all stopped by a repellant force exerted by the reflecting body and then driven back in the contrary direction by the same force. This repulsion of the particles is selective. The reflecting substance drives back one portion of the group of particles and attracts and transmits the remainder. When a particle of light approaches a refracting surface obliquely it is drawn toward the surface. Refraction is thus accounted for. The velocity of light is augmented during this deflection, and after entering the refracting medium it retains its increased velocity. According to this theory, the bending of a ray of light towards the perpendicular increases its velocity. In short, the higher the refracting index, the greater is the velocity of light. But it has been conclusively proven that the reverse is the case and that the velocity is diminished as the refraction index is increased. This is the great objection to the emission theory, and it is one which has never been answered and probably never will.

This theory was first opposed by the celebrated astronomer Huyghens and the no less celebrated mathematician Euler, but it was completely overthrown by Thomas Young and Augustin Fresnel. These two eminent philosophers, while adducing a number of facts not explained, or rather not explainable by the emission theory, succeeded in establishing the most complete parallelism between optical phenomena and those of wave motion. The justification of any theory consists in its ability to account for phenomena. This is the basis upon which the second theory rests, and it is every day becoming more securely established.

It is called the wave theory, or the undulatory theory of light. It claims that light is the production of wave motion, and accounts for the great elasticity of propagation in light by supposing the substance which transmits it to be both extremely elastic and of extreme tenuity. This substance

* Paper read before the Notre Dame Scientific Association by JOHN W. GUTHRIE.

THE NOTRE DAME SCHOLASTIC



Disce quasi semper victurus; vive quasi cras moriturus.

VOL. XVIII.

NOTRE DAME, INDIANA, MAY 16, 1885.

No. 36.

Past and Future.

BY E. P. RYDER.

Out of the chaos time and change create
We gather fragments of our happiest years,
And look on them, and wonder joys so great
Should ever be to us a source of tears.
The faded flower, the favorite book or song
Of one we loved, yet only loved to lose,
Causes the old-time memories to throng
Of days when life was tinged with roseate hues.

Not what has been, but what is yet to be,
Is that which turns our sadness into joy;
The thought, kind Lord, that we may be with Thee,
If we prove life is not all base alloy,
Quenches rebellious fires with happy tears,
And gives us patience through the after years.

—*The Ave Maria.*

Two Hours in the Biological Laboratory.

BY H. C. ROTHERT, '87.

At home, I often noticed in the evening, when batter was made for buckwheat cakes to be used the next morning, that one or two spoonfuls of some gray, suspicious-looking substance was put in. Of course, I asked, now and then, concerning the nature of these things; but, "little boys ask too many questions." However, my curiosity was aroused, and I was determined, sooner or later, to find out all about it. The next morning, the pot which contained the batter was full to overflowing, whilst the evening before the bottom had been scarcely covered. One afternoon, whilst I was alone in the kitchen, I determined to put some of the grayish substance into some dough, or batter, to see it rise. But, a step at the door,—a hasty farewell with my preparation—and I considered it best to postpone my biological researches.

Some time ago, I saw that very same grayish-looking matter in the Biological Laboratory, and, of course, I at once recognized my "old friend." I was told that on a certain day this substance was to be explained, and would form the subject of the first lesson in practical Biology. On the day appointed, I went with unusual haste to the Laboratory, for I was eager to find out all

about this mysterious substance, and I give herewith the result of my investigation.

That grayish-looking substance is nothing but a mass of plants, called "yeast" long before any of us were born. It may be described as a substance which causes alcoholic fermentation in fluids containing sugar. The yeast plant was discovered by Cogniard, Latour and Schwann, and it was this discovery that confirmed Pasteur in his views on fermentation. These yeast plants are sexless and mono-cellular, and contain no chlorophyll, or green coloring matter. Here it may be said that it is owing only to the constant and steady advancement of Biology within the last few years that the importance of the study of this plant has been recognized, as in it are implied some of the most important fundamental phenomena of life.

For the benefit of those not initiated into the working of a biological laboratory, I consider it best to describe, briefly, the various steps taken to find out the nature of this plant. We put some yeast in a small glass of sweetened water and kept the mixture in a warm place. While the preparation was getting ready (which requires about a quarter of an hour), we found out the position this plant occupies in the vegetable kingdom. It belongs to the second class of the lowest forms of plants, the *Protophyta*, and its scientific name is *Torula*, or *Saccharomyces Cerevisiæ*.

When we returned to look at our mixture, a brownish fluid, the first thing we noticed was that it began to be covered with froth, and that bubbles were continually rising from the bottom. The yeast plant, like all fungi, absorbs oxygen and gives off carbonic acid gas in the form of these bubbles. If the chemist were to analyze the yeast, he would find it to contain the following elements: carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, potassium, magnesium and calcium—the last four in small quantities. These elements so combine as to form the direct constituents, viz.: protein, cellulose, fat and water.

Now, if a drop of the preparation be observed through a hand-glass, it does not appear like one mass, as it does to the naked eye, but looks as if a fine powder had been scattered through it; and if we look at it with a considerable magnifying power, say 4–500 diameters, we may even see the structure of each yeast cell. How different it is now from the plain, brownish fluid! And yet it is the same. We can see floating in the watery fluid a

number of round masses, and we are told that each one is a plant called *torula*. They are transparent and are either spherical or lemon-shaped, having a diameter of, from 1-2500th to 1-7000th of an inch (average about 1-3000th). They are either single or hanging together like the links in a chain. Now, if we observe one of these *torulae*, we will find out the three parts that generally compose a cell, namely: the cell-wall, the protoplasm with a vacuole, and nuclei. The cell-wall is somewhat tough, but may be broken, which allows the contents to escape. This semi-fluid matter contained within the cell-wall is the protoplasm. In some cells it is darker and less transparent than in others; and sometimes it contains a few clear, shining dots. These are the granules or nuclei. Their exact composition is not known, but they are supposed to be contracted or differentiated protoplasm. Generally, in the centre of the *torula*, there is a round space more transparent than the surrounding protoplasm; this is the vacuole which contains either water or air, or sometimes oil. However, this vacuole is not always in the centre but very often on the side, and sometimes it extends almost over the whole cell. It is also absent in a few cases.

Having examined the construction of a single cell, the nature of the chain of cells remains to be explained. One of the full-grown *torulae* sends out a little bud from its side, which continues growing until it becomes about as large as the parent. This is a young *torula* which, when it has reached the full-grown stage, is either detached from its parent cell or remains adhering to it. If it does not separate itself, it will send out a new bud, which in turn again will send out another, and so on, until a string of cells is formed, all remaining connected together. These chains consist of no more than five or six *torulae*, because the cells, after having reached the adult state, are liable to break off any time. This mode of reproduction is called "budding" or "gemination." Under certain conditions, the *torulae* will multiply in another manner—*i. e.*, by endogenous division. Instead of throwing out a bud, the protoplasm of the *torula* divides itself into several masses (usually four), each of which is then surrounded by a cell-wall. These interior masses are called *ascospores*, and when they have reached the stage of a *torula*, the cell-wall of the parent either breaks or dissolves, and the new cells are set free. But as this mode of multiplication requires a preparation of eight or nine days, we must content ourselves for the present with a mere mention of the fact.

Now, to become better acquainted with our *torula*, we will feed it on various fluids. First, we will give it a drop of *magenta* solution. If we follow the solution as it is drawn in under the cover-glass, we soon notice that the cells containing the most protoplasm stain sooner and of a deeper red than the others. The cell-wall is not affected. Then, what has become of the vacuole? Has it stained with the protoplasm? No; for, if it be observed more closely, the vacuole will be found unstained, generally appearing pinkish, because it is seen through an intervening layer of

colored protoplasm. Some few cells are not stained at all, and as magenta colors all protoplasm red, it follows that these cells do not contain any, and are consequently dead. Now, let us take another preparation and apply to it a drop of *iodine* solution. This, like the magenta, stains only the protoplasm, but instead of a red, it gives it a brown color. Starch which is colored blue by iodine cannot be found within the cell; though in this particular yeast (Fleischmann's Compressed) starch granules may be found scattered profusely throughout the preparation. The yeast, as is known, feeds on sugar which, comparatively speaking, decomposes in a short time. But starch, which does not decay, is changed into sugar under a proper condition of heat and moisture. This starch is therefore put into the yeast so that, when under the proper conditions, the plantlets will readily find food and can immediately proceed to grow. If we take another drop of the fluid containing the yeast plants, and treat it with *potash* solution, an entirely different re-action takes place. We find the cell-wall unchanged, as usual, but the protoplasm is all dissolved, leaving an empty sac.

As to the vital activity of the *torula*, the following facts are known, and may be verified by subjecting the yeast under various conditions and noting the result. The growth of the yeast is greater in a fluid containing sugar than in simple water, and greatest in a fluid composed of the chemical constituents of the *torula*. Yeast is not affected by light; but it will grow faster when kept in a warm place than it will in a cold place. If the yeast, while growing, be either boiled or frozen, its efficiency will be destroyed—that is, the *torulae* are killed by exposure to extreme heat or cold.

Here we may end our observations, for we have found out something about the yeast plant. That it is a living organism; that it grows and reproduces itself. Many more points could have been studied, but let these few suffice to give a simple but correct idea of the yeast. As the yeast plant is intimately connected with fermentation, I would gladly speak also of this subject, but I hope to be permitted to refer it to a future communication.

The Country West of the Mississippi River.

III.

Summit, 7,017 feet above sea-level, and fourteen miles west of Truckee, is the highest point crossed by the railroad on the Sierra range. It is 1,669 miles west of Omaha and 245 miles east of San Francisco. The scenery in the locality, and all the way down into the valleys of California, is grand, varied, sublime. Here are towering peaks, awful chasms, deep gorges, great precipices, sparkling waterfalls, groves of fir and pine, and the headwaters of three or four notable rivers—the South Yuba, the Bear, and the American—which empty into the Sacramento. Numbers of flumes and ditches carry water in large streams to the hydraulic mining camps, so numerous on the

western slope of the Sierras. At Cape Horn, as it is called, where the American River comes into view, and looks like a silver thread 20 or 30 miles away, in the cañon to the southeast, a place is tunneled for the railroad into the side of the mountain. Above the track on one side the mountain rises 1,000 feet or more, while on the other side is a precipice 2,000 or 3,000 feet in depth. When the railroad was in course of construction in this locality the men who broke the first standing ground were held by ropes until firm foot-holds could be excavated in the solid rock. There are several flourishing towns along the western slope of the mountains, and the land in vicinity of them is generally under cultivation. The descent from the mountains is abrupt and sharp enough to attract general attention, but every mile of it brings more prominently into view the distinguishing features of

CALIFORNIA,

in respect to scenery, climate, population, material development, etc. The novelty and variety of the towns, farms, dwellings, groves, rivers, irrigating ditches, and other objects visible, quicken the senses and impart new life to the interested and pleased traveller. Sacramento, the capital, is the most important city of the interior, although its population is not over 25,000. Situated on the Sacramento River, and being fairly supplied with railroads, it is a leading business centre and distributing point. Some 35 years ago ocean steamers could navigate the river as far as Sacramento, but the mud and debris, since washed down from the mountains by the process of hydraulic mining, have been carried to and deposited in its bed, and consequently it has become very shallow. Steamboats drawing only three or four feet of water are the largest craft that can now navigate it. Furthermore, the surrounding country has thus been rendered specially subject to inundation. From time to time the river overflows its banks, and the water spreads out over the country for miles and miles, giving it the appearance of a lake or sea. Property worth millions of dollars has been destroyed, people have had to endure great privations and suffering, and vast numbers of cattle, horses, sheep, etc., have been lost on the recurrence of these irregular visitations. After some of the great freshets the ground has been found covered with a reddish and tenacious mud, three or four inches in thickness. Though the soil appears to be of inexhaustible fertility, yet irrigation is deemed necessary, in this section and all through the interior. The San Joaquin Valley, for instance, which lies southwest of Sacramento, is intersected with irrigating ditches that carry water in the volume of small rivers from the mountains 50 or 100 miles away. This great valley is about 30 miles in width and over 200 in length. Wells are also a great source of reliance in dry weather, and wind-mills erected to draw water from them are conspicuous objects on almost all farms. In summer, the whole country has the appearance of being dry and parched. The grass looks withered and has a grayish color. Dust lies inches thick on the roads, and every gust of wind

or passing vehicle may send it flying in clouds into the air. The land lies fallow and neglected. Let the vision wander where it will, it can nowhere rest upon flourishing vegetation and crops growing in the fields. The hot sun beats down upon an uninviting landscape, where the temperature frequently registers 100° in the shade. Such is summer or the dry season in the interior of California. Perhaps it is superfluous to say that the year is divided into two seasons—the dry and the rainy—on the Pacific coast. Spring, summer, autumn and winter are there unknown. People speak only of the dry and the rainy season. The appearance of the country in the former season has just been briefly described. But now a few words in reference to the latter: The rainy season sets in about the beginning of November, and lasts until early in May. The rain falls principally at night, and the days are generally clear and pleasant. At Christmas, green grass of luxuriant growth covers the whole face of the country. In January bright flowers of every hue cover in profusion the uncultivated lands on hill, in dale, in valley. In April and May the crops ripen, and in May and June they are harvested. They are generally sown in November and harvested in May. In the rainy season the days are generally pleasant in the interior, though sometimes a trifle too cool for comfort near the coast. Throughout the State in both seasons the nights are cool—so cool that a fire is commonly desirable. Land in the interior of the State is generally undulating. Hills and knobs of almost uniform size and appearance are monotonously numerous. They are ordinarily treeless, uncultivated and uninteresting. The mountains nearest to the Pacific are called the coast Range. This range extends not only along the entire length of the State, but also along the coast of Oregon and Washington Territory. It has an average elevation of 3,000 feet, and is broken here and there by small rivers and fertile valleys. It is from 10 to 30 miles inland, and the region between it and the ocean is regarded as the most characteristic part of California, when considered with reference to soil and climate. There grow the grapes, oranges and most of the other fruits of California, and there the climate is coolest and most equable throughout the year. San Francisco is built on the northeast point of a peninsula, the length of which is about 40 and the width 7 miles. North of this peninsula is the famous "Golden Gate," or the channel connecting the ocean with the Bay of San Francisco. This channel is about 7 miles in length and 2 in width. The bay itself, commodious and deep enough for all the navies of the Pacific to find ample room and safe anchorage in it, is 8 miles wide and 40 long. From San Francisco proper the bay is fully seen, and upon it the city fronts. A line of high hills intercepts the view of the ocean. San Francisco has all the marks of a great and flourishing city. The better buildings, constructed of stone, iron, brick and marble, compare favorably in size and architectural finish with those of New York and Chicago. The population of San Francisco is about 300,000,

including 30,000 Chinese. These people are very numerous on the Pacific Slope, and there is probably no town of noteworthy size in all that region—from the “Continental Divide” to the Pacific Ocean—in which numbers of Chinamen cannot be found.

California is about 700 miles in length and 200 in width. For 150 miles south of the line separating it from Oregon, it is very mountainous and heavily timbered. The Sierra Nevada, Shasta and Coast Range mountains meet in that quarter and, in a sort wild confusion, tower upward in peaks and groups of exceptional height. Mount Shasta, the highest of them, has an elevation of 14,440 feet above sea-level. South of it is the Sacramento Valley, fertile in soil, rich in resources, and distinguished by a profusion of natural beauties. Through its centre flows the Sacramento River for a distance of 175 miles, or as far south as the State Capital. Thence, turning and pursuing a westerly course, the river ultimately empties into the Bay of San Francisco, about 140 miles from Sacramento. Further inland, however, are two smaller bays—Suisun and San Pablo—which the river enters, and through which it flows. Tuiles or rushes, from 6 to 10 feet in height, grow thickly upon the river banks in some places and cover the low lands subject to annual overflow. When these “tuile” lands are properly ditched, drained and reclaimed they become the most productive in the State. Red Bluff, about 140 miles north of Sacramento, is at the head of navigation. Only small, light-draft steamboats can navigate the river, and even by these it is not much used. The facilities for transportation, however, are very good, as there are two lines of railroad in the valley, the longer of them terminating at Redding, just south of Mount Shasta. The chief towns are Red Bluff, Chico, and Marysville, all of which are eligibly situated and prosperous. Marysville legitimately enjoys the reputation of being one of the prettiest towns in the State. In the southern part of the valley agriculture is the chief industry. Further north, grazing, mining and lumber cutting are of paramount importance. It is about 400 miles long and 50 wide. Though mainly treeless, it has several small groves of oak and other varieties of hard timber. The region west of the north part of Sacramento Valley, or that lying between it and the ocean, is too mountainous for practical utility. Though numerous little valleys are scattered through it, they are so isolated and difficult of access that but few people have sought to establish permanent homes in them. Extensive forests, mainly of pine, cedar and fir, there abound.

Along the Coast Hills, however, a species of redwood may be found in several localities. The madrona and the manzanita bush are also common, and grow more or less extensively in all parts of the State. The madrona is an open growth evergreen tree, of the laurel species, with oval leaves, pea-green beneath and dark and shining above. It has a smooth bark that peels off every year. When young it is a greenish yellow; when mature, a bright red. In bark and fruit the manzanita

bush bears a close resemblance to the madrona. Birds are fond of the berries of the madrona and feed upon them, while the bears and the Indians derive a large share of their sustenance from the berries of the manzanita bush.

The Geysers constitute one of the most remarkable natural curiosities in Western California, or in the State at large. They are about 100 miles north of San Francisco. In going from that city to them the traveller takes one of the large boats of the Vallejo route, which steams out into the bay, turns north, passes Oakland, the largest city on the east side of the bay, leaves the “Golden Gate” on the west, sails into the narrower channel forming a continuation of the bay on the northeast, proceeds through that, and then enters San Pablo Bay, where the channel widens into what in this part of the country would be called a little lake. At the northeast end of this bay lies Vallejo, a city of 7,000 inhabitants. This trip by water brings beautiful scenery and many interesting objects to view. Seven small islands are passed on the way. The towns of Saucelito, San Rafael, San Pablo and Benicia are seen in the distance. Mount Diablo, too, which lies midway between Oakland and Stockton, is a conspicuous object. From Vallejo the traveller goes by rail to Calistoga, 73 miles from San Francisco. Through all this section vineyards are numerous, and much attention is evidently bestowed upon fruit-raising. Five miles west of the town of Calistoga is the celebrated “Petrified Forest.” It comprises about 40 acres, and the ground is more or less thickly covered with petrified trees. Some of them are 25 feet in circumference. Most of them have fallen and are covered to a great extent with earth and volcanic matter, while the ground fairly sparkles with silica. From Calistoga stages run to the scattering towns in the mountains within a radius of 50 or 60 miles. Twenty-six miles northwest of it are the Geysers. They are in a little valley that looks not altogether unlike the crater of a great volcano. It is about 1,600 feet lower than the general level of the surrounding hills. The descent to it is abrupt, steep and difficult. In a little ravine at one side of this basin or valley are over 200 mineral springs. In some of them the water is ice cold, in others boiling hot; in some it has a sweetish taste, in others it is sour or bitter; in some it tastes of soda, while in others sulphur, magnesia, iron, salt, alkali, etc., predominate. Sulphur deposits, of singular diversity of colors, being white, black, red, yellow, etc., are numerous. The ground around the springs appears to be little more than a mere crust. It shakes and trembles in manifest obedience to the energy of internal fires. Boiling water of inky blackness shoots up at irregular intervals from these infernal caldrons, beneath which an inextinguishable fire seems to burn and rage. An oppressive heat fills the whole place, the fumes of ammonia and sulphuric acid gas blend; the ground is sufficiently agitated to produce dizziness, steam rises in puffs and clouds, and greatly circumscribes the range of vision, and odors too strong for even a Chinese festival hang over the

uninviting scene. At the same time, the almost terrified spectator hears a confused commingling of peculiar noises, as the elements contend and clash, roar and rumble, hiss and spurt, bubble and steam, with an occasional sepulchral detonation like underground thunder to serve as chorus of the awful din. It is a spectacle that evidently surpasses the fancy of that highly imaginative thinker, Col. Ingersoll, and it would probably do him good to go there and see it. One of the springs is known as the "Devil's Grist-Mill"; another the "Calliope"; and then the "Steamboat Geyser," the "Witch's Caldron," the "Mountain of Fire," etc.

Among the valleys best known and most populous in the country north of San Francisco are Petaluma, Santa Rosa, Russian River, Sonoma, Napa, etc. These are generally small of size, though the land is well adapted for fruit-raising, grape culture, grazing, agriculture, etc. Northern California is very mountainous and heavily timbered. The whole country, excepting the little valleys, is covered with dense forests to the very shore of the ocean.

There is a material difference in many respects between the northern and the southern part of California. The latter is warmer, dryer, and far less abundantly supplied with water and timber. The San Joaquin Valley is the most fertile and extensive body of agricultural land in it. In width it is about 30 miles, and in length 200. It extends as far south as Visalia, in Tulare county. Tributary to it are several small lateral valleys, of which special mention need not be made, as they compare with it in appearance, fertility, etc. Scattering groves of hard timber greatly enhance its beauty. The principal products are wheat, corn, barley, rye, beans, peas, potatoes, etc. Tobacco and cotton also grow in it. The valley embraces more or less of nine counties, but Merced is the richest of them. This is 140 miles from San Francisco, and almost directly west of the celebrated Yosemite Valley, which is situated at the western base of the Sierra Nevada Mountains.

Yosemite Valley runs into and among the mountains for a distance of eight miles, and they rise to almost perpendicular heights on both sides of it. Its width varies, being half a mile at some points and a mile at others. The Merced River comes down from the mountains at the head of the valley, in a series of waterfalls, to which enchanted tourists have given distinctive names. The granite mountains rise almost vertically on either side of the valley to heights varying from 2,000 to 6,000 feet. The most notable waterfalls are known as the "Ribbon," 3,300 feet; the "Upper Yosemite," 2,634 feet; the "Bridal Veil," 950 feet; the "Nevada," 700 feet; the "Lower Yosemite," 600 feet, and the "Vernal," 350 feet in depth. Of the mountains, the "South Dome" is 6,000 feet high; the "Three Brothers," 4,000; the "Cap of Liberty," 4,240; the "Three Graces," 3,750; "North Dome," 3,725; "El Capitan," 3,300; "Sentinel Rocks," 3,270; "Cathedral Rocks," 2,690 feet, etc. Here are waterfalls that seem to burst forth from the clouds and come down from

them in the volume of rivers; here are little lakes of great depth, with water pure as crystal; here are dark gorges and awful chasms; here are towering cliffs of granite whose summits, like silver pointed spears, pierce and disappear among the clouds; here is probably the grandest, most interesting, most varied, and most beautiful scenery in America, if not in the world.

A few miles southwest of Visalia is a magnificent body of water called Tulare Lake. It covers an area of 7,000 square miles, being 30 miles long and 25 wide. Kern Valley begins in this quarter. The soil in it is very productive, being largely composed of sedimentary deposits. It is watered by means of irrigating canals, artesian, wells, ordinary wells with windmills, etc. Some of the canals are 40 or 50 miles long, eight feet deep, and from 100 to 275 feet wide. The water is mainly secured from Tulare, Kern and Buena Vista lakes and White Rock Creek. Many of the largest ranches or farms in the State are to be found in Kern Valley. Further south the Mojave desert comes into view. But between it and Kern Valley a formidable mountain range looms up. In ascending and passing over this range the railroad had to be constructed so as to cross itself at what is known as the "Loup," or Tehachapi Pass. Much difficulty was encountered there in building the railroad, and innumerable tunnels had to be constructed. Between Caliente and the summit, a distance of a few miles, there are no less than 17 tunnels. The desert is arid, bald and bare. Sandstorms frequently sweep over it. Only cactus and a stunted species of sagebrush seem to be capable of taking root and growing in it. A species of cactus seen there and in Arizona grows to enormous dimensions, sometimes attaining a circumference of 8 or 9 feet and a height of 50 feet or more. Further on in a southwesterly direction, across the Santa Clara Range, San Fernando comes into view. Here the scenery, soil and climate are changed as if by magic. The luxuriant vegetation and manifold beauties of a tropical climate rise before the vision with almost startling suddenness. Here grow orange, lemon, fig, pomegranate and almost all the southern and tropical varieties of fruit trees in perfection and profusion. Vineyards, too, cover the country for miles and miles. A short distance beyond is the beautiful and enterprising city of Los Angeles. Though from 17 to 25 miles from the ocean, it has three harbors tributary to it and railroad communication with each of them. They are Santa Monica, San Pedro Bay and Santa Ana.

West of the Mountains as far as San Diego, in the extreme southern part of the State, the country is generally fertile, although sparsely populated. Irrigation is necessary to make the land productive. The climate is delightful. Probably nowhere in the world is it surpassed in mildness and unvarying temperature. From Los Angeles the railroad follows the Santa Ana Valley in a southwesterly direction, the main range of mountains being on the left. The towns along this valley are small, scattering, indifferent. At San Geronimo Pass the

country again becomes arid, dry, desert-like in appearance. Beyond the pass the road descends into the Colorado Desert. This was undoubtedly at one time the bed of an inland sea. There is a down grade for 61 miles, and then the railroad is 263 feet below sea-level. The valley of the lower Jordan and the shores of the Dead Sea are not more barren than this region. For miles and miles not a shrub nor even a blade of grass is to be seen. The fatigued vision searches in vain for some little oasis in this howling wilderness of rock and drifting sand. A thin line of vegetation, mainly sage-brush, may in some places be seen far off on the distant hillsides; but in the desert proper there is no water, no sign of vegetable life—nothing but rock and sand—sand and rock. In one portion of it, however, a large deposit of salt has been discovered. And mud volcanoes, too, have been found. In one of them the mud spouts up through at least 20 apertures and crevices. Sand-storms are not unusual, and in some instances the sand and pebbles are pelted with great fury, breaking the windows of the station-houses.

ARIZONA.

Just beyond the desert Fort Yuma, and the town of that name, the Colorado River and the Territory of Arizona come into view. But the country still maintains its desert-like appearance. Yuma is situated on a low, level, sandy plain, the prevailing hue of which is a dull, ashen gray. The sun beats down upon the muddy river and surrounding sand dunes with an intensity almost prostrating and a glare almost blinding. The sky is wonderfully clear. There is compensation for the heat in the fact that the richest and deepest of colors flash out along the horizon morning and evening when the sun rises and sets. These colors paint all the landscape and shine forth in countless splendors on the crests of the distant mountains. A large part of the Territory of Arizona is not specially inviting to the traveller or to anybody. It presents to the view broad, gravelly plains, bearing only cacti, with here and there the leafless palo verde tree and the ubiquitous sage-brush. In the distance are seen high mountains of granite, to which the vision vainly turns for relief. These barren and dazzling masses of rock are seen in every direction.

There are several vast desert tracts in Arizona, and the sole occupants seem to be lizards, scorpions, tarantulas and rattlesnakes. Everywhere among the mountains can be seen indications of fierce volcanic action. The country is thinly settled, insufficiently watered, and not adapted, except in a few favored localities, for grazing and agriculture. Timber is also very scarce. Mining is the leading interest, but it is carried on at a great disadvantage on account of the scarcity of water. Arizona is a strange, wild, wonderful region. It has vast plateaux, extensive deserts, timbered table-lands, lofty mountains, deep gorges and impassable chasms. Its scenery exhibits great diversity and is seldom tame. No place could be more interesting to the geologist and the student of nature.

THE NORTHWEST COAST.

Before closing, at least a few words must be said relative to Oregon and Washington Territory. With the exception of the Willamette, the Umpqua, and some of the smaller valleys, that whole region is covered with dense forests of fir, cedar and pine timber for a distance of 160 miles from the ocean. Excepting in the valleys named, the country is almost uninhabited. The timber in these almost interminable forests is of remarkably large size, many of the trees being 250 or 300 feet in height and 25 feet in circumference. East of the Cascade mountains, which are a continuation of the Sierras, there is but very little timber. The great basin of the Columbia River has an elevation of about 2,000 feet above sea-level, and water is generally not abundant enough to render the land available for agricultural purposes. It seems, however, to be well adapted for grazing, and vast herds of cattle roam over it. About 100 miles east of the mountains water and timber become more plentiful, and, by means of irrigation, the land is there rendered exceptionally productive. Such is particularly the case in vicinity of Walla Walla. That section and the country northeast of it, extending into Idaho and Montana, have great natural resources, a very productive soil, and more than the customary complement of timber and water, and can hardly fail in time to become a most populous and important part of the Columbia River region.

I am inclined to believe that a more accurate idea can be formed in respect to the general appearance of the Pacific Slope if I refer a little more explicitly to

THE MOUNTAINS

before taking leave of the subject. One great chain of mountains runs along the Pacific Ocean, from the southern border of Paraguay to the Arctic Ocean. It is known by different names in different countries and States throughout its hemispherical sweep. In South America it is called the Andes and the Cordilleras; and some of its most prominent peaks in that quarter, as the Nevado de Serato and the Nevado Illimani, rise to elevations of 25,300, 24,450 and 24,200 feet above sea-level. A portion of this great chain deflects to the east in Colombia and Venezuela, and faces the Caribbean sea on the south. In that range is the most notable and majestic instance in the world of perpendicularity in mountains. It is the Silla of Caracas, which rises to an altitude of almost 7,000 feet, and overhangs the sea. The grandeur and sublimity of the spectacle can better be appreciated when it is stated that in all the Alps there is no elevation of even one-fourth of that height which at all sustains comparison with it in perpendicularity. Most mountains gradually slope upward from their bases at an easy angle, and may be ascended to their very summits.

Among the Andes one beholds some of the sublimest objects in nature—mountains whose granitic foundations are among the palms of the tropics,

while their summits are hidden in the never-wasting snows of polar climes. The eternal winter of their summits finds explanation in remembering that 352 feet in height is equivalent in its effect on the mean temperature to a difference in latitude of 60 miles, each being attended by a change of about 1° F. Near the equator perpetual snow covers the mountains at the height of 15,207 feet; in latitude 60° it is found at 3,818 feet, and in latitude 75° at 1,016 feet.

In passing northward along the Isthmus the shining crest of the mountains is bowed to the majesty of sea and ocean, and their altitude is only 300 feet. But in Central America and Mexico they take leave of their humility and rise in famous peaks to regions high above the clouds and inaccessible to man. In Mexico they spread out from east to west for a distance of 100 or 150 miles, and attain an average elevation of 7,500 feet. There the principal range is known as the Sierra Madre. Still developing in width and augmenting in perplexity, they enter the United States, and, just north of the Mexican border, exhibit the greatest depression that marks their onward sweep to the frozen ocean of the north. In that latitude the continent may be crossed without exceeding an elevation of 4,000 feet above the sea. There the mountains still further separate and spread out more definitely, assuming the character and appearance of independent ranges. The Rocky Mountains, which constitute the main range, deflect to the northeast; but, on entering Colorado, turn to the north and so continue until they reach the northern part of Wyoming, where one of the grandest and most awe-inspiring of Nature's wonders on the American continent—the Yellowstone National Park—is to be found. Then they turn more obliquely to the northwest and maintain that direction until within 700 miles or so of the ocean. There they turn northward again and so continue to the end. The Sierra Nevada Mountains form for a considerable distance the boundary between Nevada and California. In Oregon and Washington Territory they are called the Cascades. Thence they continue their course northward to Alaska. The Coast Range follows the general contour of the coast. It includes the Barnardino, Santa Clara, Contra Costa, Shasta and Umpqua Mountains. In Washington Territory the ranges are disconnected and broken to a great extent. The region along the Columbia River from the ocean to the Cascades is distinguished by low mountains of well rounded outlines, all of which are heavily timbered. Around Puget Sound the mountains are loftier and bolder, the majestic Mount Ranier being a conspicuous example; but there, as elsewhere, the forests seem to be interminable and crowd down to the very verge of the water.

Timber does not grow and vegetation practically ceases upon the mountains at an elevation of 11,000 feet above sea-level. Higher up, hardly anything but mosses, with a few straggling wild flowers, can be seen among the rocks and the snow. One can hardly behold this contrast—delicate flowers growing among the mosses high above timber-line on

the mountains—without being quickened by salutary reflections and thinking of the glory and greatness of God, whose omnipotence finds illustration in the flowers, as well as in the mountains. Inspired by such thoughts, how meet and natural to invoke Him as

"God of the granite and the rose,
Soul of the sparrow and the bee;
The mighty tide of being flows
Through countless channels, Lord, to Thee.
It leaps to life in grass and flowers,
Through every grade of being runs;
While from Creation's radiant towers
Its glories flame in stars and suns."

College Gossip.

—Professor in French to student: "*Ces Dames*." Student takes him at his word—general confusion ensues.—*Ex.*

—Senator Stanford, of California, will begin the erection of the new Palo Alto University when he returns to San Francisco this month.

—The prize offered by the editorial department of the *German Students' Gazette* for the best students' song has been won by a Dresden lady.

—An exchange tells us that there are thirty-one colored students in the Freshman Class at Yale. Of these, seven are students in law, eleven divinity, and the remaining thirteen medicine.

—The members of the Cornell Faculty are having a great deal of trouble in enforcing the fifteen hour rule, by which no student can take more than fifteen hours a week, unless by special petition.

—Sixty Harvard Freshmen have dropped their Latin, eighty their Greek, and one hundred their mathematics. None of them have dropped their baseball or boating, however, and college culture is safe.—*N. Y. Sun.*

—The new college in charge of the Fathers of the Society of the Holy Ghost at Pittsburgh, Pa., was dedicated with great ceremony, on Sunday afternoon, the 3d inst. It is a large and commodious five-story structure, and designed especially to provide for the higher education of the youth of Pittsburgh and vicinity.

—Of the students who graduate at the German gymnasias and enter the universities, only two-thirds of one per cent. are under seventeen; five and a half per cent. only are as young as seventeen; nineteen per cent. are eighteen; nearly twenty-eight per cent. are nineteen; nearly twenty-five per cent. are twenty, and twenty-three per cent. are over twenty.

—The public hears from time to time of a discussion over the question of public worship at Harvard University. In point of fact, there are at present no regular Sunday services in the college chapel. During the winter an occasional discourse was given. Attendance upon some church on Sunday is no longer requisite, but by a recent decision compulsory attendance upon morning prayers in the college chapel is continued.—*N. Y. Sun.*