Correspondence.

Chinnook Winds.

A NEW THEORY BASED ON SCIENTIFIC OBSERVATION.

To the Editor of the Scientific American:

I have for two or three years past felt a deep interest in the phenomena so often presented here in Eastern Montana, and termed the Chinnook wind. This is a wind blowing to us from W.N.W. or N. 77° 30′ W., never varying its course. There is nothing in physical or in meteorological science that teaches us that a wind from this direction could be superficially heated by the surrounding temperature or the climatic conditions prevailing in the latitudes from whence it comes; and careful thought long ago convinced me that, even could a warm wind originate in almost the Arctic regions of the far northwest, it absolutely must be robbed of all superficial heat in the passage over two thousand miles of fields of snow and ice encountered before reaching the plains of Eastern Montana. These mental deductions led me to make instrumental observations on the late Chinnook wind, which swept over this region on the 23d and 24th of February last. The wind struck at 2 A.M on the morning of the 23d, accompanied by a light shower of rain. At 10 A.M. on the 23d, the wind appeared to come down from the passing clouds; to test and fully demonstrate the fact, I attached a light streamer to a pole three times its length, and set the flag upon an adjacent elevated crowning *butte*. The dip of the streamer throughout the whole period of the wind, which prevailed for forty-eight hours, was 22° 30′ below the horizon.

On Monday following, when the wind changed to the northward, the streamer stood out parallel with the horizon, inclining a little upward, not unlike a streamer on the topmast of a schooner. I do not think that the streamer was influenced by the topographical features of the land in close proximity. The above experiment appears to show conclusive evidence that the Chinnook winds come from the higher atmosphere, and therefore refutes the old idea that this class of winds are the Pacific trade winds breaking through the mountain passes, and so finding their way to the cattle fields of Eastern Montana. In connection with observations above detailed, I further noticed the peculiar effect produced upon the snow and ice, the former being apparently dissipated and the latter disintegrated, as if the effect was not due to the presence of heat so much as to a chemical reagency. As a further proof I would cite that either by the sun's rays or a warm wind the snow would only be taken from the surface, but I find such is not the case with this wind. Taking the angle before given and observing it strictly on the side hills to leeward (to use a nautical term), and lying below the angle of incidence, 22° 30′, and no marked effect was produced upon the snow and ice, while surfaces exposed to the wind within this angle were entirely freed from snow, and in the case of ice the body was disintegrated to such a degree that it was rotten or brittle, *i. e.*, devoid of molecular affinity.

The great region embraced between the Rocky Mountains and the Dakotas, comprising the Yellowstone Valley, was, on the morning of the 23d of February last, covered with snow from one to two feet deep, and the ice, in the several great rivers, ranged from two to three and a half feet thick. In a little less than forty-eight hours this vast region was shorn of these habiliments, and its tributary rivers were all flowing into the principal valleys below.

The deductions are that the Chinnook is an upper current of air, so to speak, of one of the atmospheric arteries, bearing a regular and defined course, as note the Gulf Stream in the ocean; that this aerial current becomes depressed and reaches the earth, and that the portion of such current that strikes any part of Montana is in all its elemental purity, and only comes in contact with the surface at the point where we observe its influence at work, and has not previously blown over and been in contact with other snow and ice. The wind itself is not noticeable for any element of warmth, but on the contrary it is raw, and a person exposed to it for any length of time experiences a chill feeling.

WILLIAM B. GAW,
Civil Engineer.

Miles City, M. T., April 16, 1884.

Walking, Running, and Jumping in England.

Four miles an hour is the ordinary standard pace for a good, brisk country walk; what shall we say, then, to eight miles in an hour, fair heel and toe? Yet this has been done by W. Perkins, J. Raby, Griffin, and other professors of the art. Perkins, indeed, has walked one mile in 6 minutes and 23 seconds—a rate of progression nearly approaching 9½ miles an hour. On the same occasion he walked two miles in 13 minutes 20 seconds, and three in 20 minutes 47 seconds, both unequaled records. The greatest distance ever walked without taking a rest is 120 miles 1,560 yards, by Peter Crossland, of Sheffield.

The greatest distance ever run in one hour is 11 miles 970 yards, by Deerfoot, at Old Brompton, in 1863—Deerfoot's real name being L. Bennett, Cattaraugus County, New York State. The fastest time in which one mile has ever been run on level ground is 4 min. 16⅛ seconds, by W. Cummings, of Paisley, in 1881, at Preston; but in 1863 W. Lang ran a mile over a course which was partly down hill in 4 minutes 2 seconds. The *swiftest* runner hitherto seen is a man named Hutchens, formerly newsboy at Putney Station. In a Sheffield handicap he has covered 131¼ yards in 12¼ seconds, a performance which shows him many yards better than "even time" at 100 yards, and even time is the unattained ambition of the great army of amateurs. (A hundred yards in "even time" means 100 yards in 10 seconds, or a rate averaging 10 yards per second.) And he has performed the prodigious feat of covering 300 yards in 30 seconds, dead, the most wonderful piece of running on record.

In 1873 R. Buttery, of Sheffield, ran a quarter of a mile in 48¼ seconds, which remains unbeaten to this day. George Hazael has run 50 miles in three seconds less than six hours and a quarter, and he has also performed the prodigious task of covering 600 miles in a 6 days' "go-as-you please," a pedestrian journey in which the competitors may run or walk as they prefer.

As to jumping, amateurs who patronize the sport jump without any artificial aid. The records among the latter are both held by the same athlete, P. Davin, of Carrick-on-Suir, Ireland, who has cleared 6 feet 2¾ inches high, and 23 feet 2 inches wide, both at local athletic gatherings. M. J. Brooks, who in 1876 won the Inter-'Varsity high jump with 6 feet 2½ inches, is said to have cleared an inch more in practice. John Howard, a Bradford professional, more than once cleared a full sized billiard table lengthways—a feat requiring courage as well as ability; and on one occasion, on Chester race course, he jumped the enormous distance of 29 feet 7 inches! He took off from a wedge-shaped block of wood, raised four inches from the ground, and carried a five pound dumb bell in each hand. In pole jumping—prettiest of all athletic pastimes—the great height of 11 feet 4½ inches has been cleared by the present amateur champion, T. Ray, of Ulverstone.

Optical Illusions.

When the eye is deceived and a person misled by things seeming to be what they are not, it is spoken of as an "optical illusion." The familiar expression that "seeing is believing" implies that most people trust to their eyes more than to their other senses. "I have seen it with my own eyes" is looked upon as an indisputable, a convincing argument, although there are a few doubting Thomases who would add the testimony of the sense of feeling to that of sight before admitting that a thing is actually so.

The facts in the case are that any one of our senses may mislead us, and will do so unless we unite caution with experience. As sophists use logic to prove the false true, so the ventriloquist by the exercise of his art deceives the ear, and the sleight of hand performer cheats our eyes. How is this possible?

Certain rays of light coming from a distant body enter the eye, and produce certain sensations upon the retina, which sensations are reported to the brain through the optic nerve.

The brain interprets the signals by the aid of past experience, and we *think* we have seen the distant object. In fact, we have only received a message from it. If the telegraphic operator in Washington strikes his key twice, the New York operator writes down O, but if he strikes it three times the latter writes down S, unless he fails to hear the third tick, or thinks he has heard but two, when he is led into the mistake of writing O where he should write S. The signals when correctly given may be interpreted correctly or incorrectly. So the signals correctly registered on the retina and reported to the brain may be incorrectly translated and interpreted, thus resulting in an error, an illusion.

Place a man and a dog side by side at a distance of 20 feet, and any person with an eye capable of distinguishing them will be able to tell which is on the right, which on the left. The eye is not easily deceived as to position at right angles to the line of vision. Let the man advance 5 feet; it is easy to tell that the dog is farther away than the man. Next, place the man at a distance of 100 feet, the dog at 105 feet; it is not so easily decided as before, although mistakes are rare with a normal eye. But at 500 and 600 feet, respectively, it is less easy, although we can still tell which is to the right and which to the left. The images formed on the retina by the same object at different distances are very similar, differing only in size and distinctness. For this reason it is difficult to judge of distances, requiring much practice. A person standing on a straight strip of railroad is rarely able to tell whether a distant train is approaching, or receding, or at rest, so slight is the change in apparent size from which the distance is to be estimated. Upon the sea it is very difficult, without long practice, to judge of distances.

As a curious instance of inability to judge of distances, and hence of the direction of horizontal motion, may be mentioned that of the governer of a steam engine. At a certain distance (say 50 feet) the eye will seem to see the balls turning in a certain direction, but on next looking at them this motion seems to have changed to the reverse, and after several alternations the mind becomes perplexed, and finally is able to see them turning either way.

An outline drawing of a cube may be made to look like the interior or exterior at will at a considerable distance; the real cube can be made to do the same. Shading, perspective, etc., are resorted to by the artist to give the idea of distance.

In the matter of *direction* deception is not so easy as in distance. Our experience tells us that if a person hits us in the back with a ball he is probably *behind*, not in front of us. The object seen lies in the same direction as that from which the light comes when it enters the eye. If by any means the direction of the ray has been changed between the time when it left the object and the time when it reached the eye, this rule is violated, and deception results. When this change is effected by the reflection it is attended with more or less loss of light, sometimes with distortion, and a little experience leads one to suspect a reflecting surface. If the mirror is very perfect, the most careful person is liable to be misled. The well-known "ghost" is due to the reflection of a strongly lighted figure from a plate of unsilvered glass. Many of the best tricks, with floating heads and the like, are arranged with mirrors. No illusions are more perfect than those produced with mirrors.

Refraction always changes the apparent place of an object, so that we seem to see the sun after it has gone below the horizon. A more striking but less frequent phenomenon of refraction is that known as *mirage*. Refraction also affects the color of an object.

The media through which light passes has more or less effect upon the ray. In a fog objects are dimly seen, the effect resembling that due to distance, hence objects look larger, for the eye judges of the size of an object by multiplying the size of the image or impression received by the square of the distance, while the latter is estimated from the indistinctness of the object. In the fog the apparent distance is increased, but the eye interprets it as due to the opposite cause.

On looking at the photograph of a tree, a church, a monument, or a pyramid, it is not possible to form a correct idea of its size unless a man or animal is seen in the same view with which to compare it. In nature, especially on land, the intervening objects that lead up to it give the data on which to calculate the distance. Where none intervene, as in looking from peak to peak, the eye must depend on distinctness, and where the air is very clear and transparent, as in Colorado, distances seem less than they are.

If the object is seen through transparent, but colored, media, the form remains true, but the colors are changed.

On looking directly at the loop or curve of an incandescent lamp it is frequently difficult to distinguish its form, the whole loop being radiant and dazzling, while its reflection is so much less brilliant that the form of the carbon is easily discovered. A wire or bar of iron looks much larger when red hot than when cold for the same reason, and a fire at night seems nearer, owing to its brightness, than in the day.

No better proof is needed of the fact that the eye does not and cannot measure distance, but only gives more or less imperfect data from which the mind calculates the distance, than the child's efforts to grasp the moon, and of the dog that bays at that distant luminary which looks so near; nor can any of us, with our naked eye, estimate the relative distances of the sun and stars.

The shape and color of an object are all that the eye alone can report with tolerable accuracy, but by experience we learn to distinguish the texture of substance, the nature of surfaces, and many other things that belong more properly to the sense of touch. We distinguish satin from velvet and wool from cotton at a glance. The painter's art largely consists in deceiving the eye; in so mixing and blending his pigments that they produce the same impression as stone and wood, or earth and trees, or flesh and blood would do, and the greater his skill, the more perfect the deception. The imitation is rarely so perfect as to deceive the experienced, and yet the pleasure derived from the imitation exceeds that given by the reality, just as misery and suffering, when well depicted on the stage, give pleasure, but the sight of the reality gives pain.

In many things the mind enjoys being deceived, and optical illusions give us pleasure, so much so that those who are capable of completely deceiving this acutest of our senses get well paid for exercising their talents. H.

The Flying Machine Problem.

Mr. Paul Mayo, of Lausanne, Switzerland, has lately printed a monograph on "Sustaining bodies in space by motive force," and writes us as follows on the subject:

"The wings of the common fly vibrate at the rate of 330 strokes per second; those of the mosquito about 2,000 times per second; therefore, according to the formulas which I have established, a number of common flies, weighing altogether 20 tons, and 130 tons of mosquitos, would require about 1 horse power to sustain themselves in the air. It is encouraging for the many whom the question of the flying machine interests, to know that in certain conditions an enormous weight may be kept above ground by means of a very small power exerted, as in the case of the mosquito, the fly, etc. These conditions can be easily obtained, and in this respect we are placed in as good a position as nature. Any one can obtain iron in such form that it will float on water. A very good size of wire to construct floating iron rafts is $\frac{1}{20}$ of an inch in diameter. The wire is to be scraped with sand paper and well washed with soap water. In this wise rafts are obtained which can bear a charge nearly twice their own weight without sinking, *i. e.*, much better than poplar would do—one of the lightest of all species of woods.

"During the study of this question of sustaining forces in space, I came many times to what seemed to me a strange conclusion; for instance, that any piece of heavy metal must float on *perfectly still* water. But as it is impossible to have *perfectly* still water, the property is subordinated to certain conditions."

DR. LE PLONGEON'S LATEST AND MOST IMPORTANT DISCOVERIES AMONG THE RUINED CITIES OF YUCATAN.

(*Continued from page* 263.)

The mural paintings upon the walls of the inner room of the Mausoleum of Chaacmol are separated into tableaus divided by horizontal lines. Each figure is about nine inches high, and as we have many reasons for supposing thatthese people were about our own size, perhaps a little bigger, we may say that the artist allowed one and a half inches for each foot. The outlines are bold, decided, and graceful, but the tints are flat, and the perspective was evidently not understood by those artists, except in a very limited manner. Nevertheless, as these are the only actual mural paintings that we have found during a ten years' study in the ruined cities of ancient Yucatan, we consider them of remarkable interest and value, being the last remnants of the art of painting (mural) among the Mayas. Religious ceremonies, battles, and domestic scenes, as well as grand processions, are depicted on that wall—a fading gem of antique art.

In 1875 Dr. Le Plongeon made tracings on transparent paper of the best preserved tableaus, and from these tracings a facsimile of those portions of the wall was made and lent to the Metropolitan Museum of Art, Central Park, N. Y., where they are now on exhibition. At the time we made these tracings (1875) one part of the precious wall was covered with the dirt of centuries; for, alas! these palaces are now the abodes of bats and swallows, that build their nests in small, square holes on the sides of the roofed arch—holes that supported the ends of wooden beams of choicest wood, polished, and sometimes carved. We had not then with us the means of cleaning those paintings, but now (1884) came prepared to cleanse and copy all that could possibly be saved. To our grief, we at once saw that some one had tried to clean the wall by *scratching* off the dirt. In answer to our exclamations of disgust, some of the soldiers that escorted us in our expedition said: "Oh, yes! that gentleman who came two years ago did it; he scraped it with a machete, and said: 'Look at this ugly little old woman!'" We said: "What! did M. Charnay do that?" "No, it was M. the *Consul Americano*, who accompanied M. Charnay." We left the wall as we found it; it was no longer in a condition to be copied.

Plate 1.—SCULPTURED STONE WORK.

The jambs of the door of this funereal chamber, and the square pillars that are against them, forming, as it were, a triple jamb, are covered all over, on every side, with warriors dressed and armed. The work is perfect, and painted in bright colors. The figures are nearly life-size, and Dr. Le Plongeon has made moulds of all, they being important to show the various types, dresses, insignia, and weapons. The faces, whether sculptured or painted, are in profile, not because the Maya artists did not know how to make a full face, for the sculptures in the round prove to the contrary, but because they preferred it; just as they did the triangular arch to the round, which they knew well enough how to make, for on the very wall just mentioned domed buildings are painted. I must also say that the aborigines are generally better looking side face than full face, and they must have been well aware of the fact; even though the beautiful Maya women, say the historians, did not use a looking glass to see what position best suited their face; only the men indulged in that vanity.

The most interesting remains of the art of sculpture among the Maya are the *sapote* beams that form the lintel of the funereal chamber. Unhappily, the carving of that lintel has been much defaced by individuals who have hacked it with machetes. What remains shows how exquisitely those Mayas could carve wood in most intricate designs.

Dr. Le Plongeon has made moulds of the lintel, as much for the historical teaching it conveys as because it is the last specimen of wood carving among the ancient Mayas. On examining the closeness and depth of the lines, we find it hard to believe that the artist had no finer tools than those of obsidian or silex; the intaglios are nearly three-fourths of an inch deep, and *sapote* is very hard wood. In making the mould of these carvings Dr. Le Plongeon discovered that the surface of the wood was covered with a thick coating of a yellowish gummy substance, that when rubbed with a wet brush yielded a thick, froth-like soap, which led us to suppose that the substance, whatever it may be, was used by the artist to preserve the wood from insects and protect it from atmospheric influence.

In the year 1875, when we unearthed the statue called Chaacmol, now in the museum at the capital of Mexico, Dr. Le Plongeon discovered a monument that he considered of great importance, and, returning here, he decided to examine the interior. He succeeded in measuring the original dimensions, though it was reduced to little more than a shapeless pile of stones, with broken stairs on one side, and covered with bush. The structure was square, its four sides faced the cardinal points, and on each were thirteen stairs, three meters eighty centimeters wide, that led to the top platform, exactly four meters above the ground, and sixteen meters square. In the center was a large stone slab, on which formerly was a statue of a man about double life-size, in a reclining posture, like the statue Chaacmol.

The fragments of this gigantic statue are scattered at the base of the mound, only the lower limbs being entire, which show us the position it had. On the sides of the monument, in the spaces between the stairs, there were finely sculptured stones.

Only a few are now in place, and Dr. Le Plongeon has made photos and moulds of them. The largest is one meter twenty-five centimeters high, and one meter thirty-five centimeters wide. It is a human face within the distended jaws of a snake, and on the sides of the face are Egyptian letters that give the name Cay Canchi. [Plate 1.]

On the north side of the mound, in a part where there was neither sculpture, stones, nor stairs, we set our men to open a trench one and a half meters wide, to reach the center of the mound, the interior of which consisted of unhewn stones, piled one over another, and mortar that seemed to have been poured among them. As the work proceeded, the sides had to be propped with a strong palisade made of tree trunks cut from the surrounding bush, to prevent the loose stones from falling on the laborers. [Plate 2.]

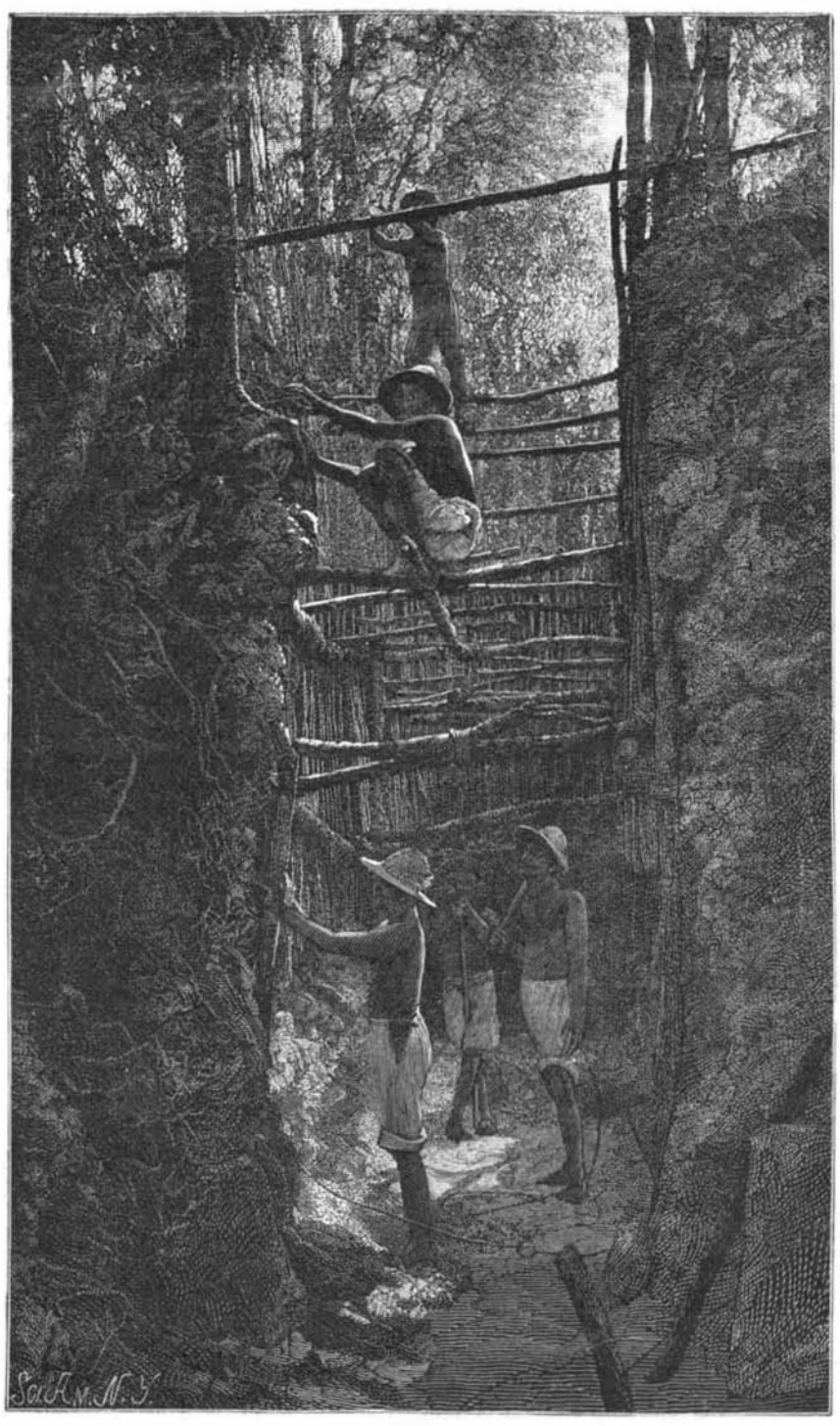

Plate 2.—HOW THE EXCAVATIONS WERE MADE.

Oxalic Acid.

Oxalic acid we obtain mostly from wood sorrel and the sorrel tree, but it is contained in many other substances. It is manufactured in large quantities from heated sawdust in connection with hydrate of potassium, etc. Oxalic acid is in colorless and odorless crystals, with a strong sour taste. It is soluble very slowly in eight parts of cold water to one part of oxalic acid, but is easily soluble in hot water. It is very poisonous, and many cases of poisoning have already occurred in lithographic establishments by mistake when regular or common salt should have been used. It is a sure remedy, when not too late, to give the person who has swallowed oxalic acid large draughts of water mixed with white chalk.

Oxalic acid is used for preparing stones for engraving, and is greatly preferable before etching with nitric acid when machine ruling is to be applied on an engraving. It only requires a little more weight on the diamond, as the oxalic acid produces a layer on the surface of the stone, which the diamond has to cut through; otherwise, all lines would not have the necessary strength and would look broken; but when the diamond has cut through the layer, the lines will print sharper and more distinctly than in the etching with nitric acid. It also prevents scratches on the stone from taking ink. Oxalic acid is also used for keeping the edges of the stone clean in the steam press. A solution of ten parts of dissolved gum arabic, one part of oxalic acid, and one part of phosphoric acid is the best preparation for stopping out lights and correcting errors on engraving stones. This acid is not effervescent, and does not spread out as nitric or muriatic acid does. It is also the best acid to take off any dirt or scratches from old engravings; but very great care must be taken that no work is touched that is to remain on the stone, for where the oxalic acid is once applied the ink will not easily take hold again. Therefore it shows what is a good remedy for one thing is a very dangerous thing for another.—*Lithographer.*

An Enormous Puff Ball.

My friend, Prof. R. E. Call, has handed me a photograph of a puff ball, the largest on record. The fungus was found by him in Herkimer County, N. Y., in 1877, and as it was impossible to preserve it, careful measurements were made, and photographs of it were taken. It was irregularly oval in outline, and much flattened, instead of approaching the spherical form, as is common in the large puff balls. Its largest diameter was five feet and four inches, its smallest four feet and six inches, while its height was but nine and a half inches. In reference to it Professor Call described it as "much larger than the largest wash tub we had at home."

The specimen undoubtedly belonged to the species known as the giant puff ball (*Lycoperdon giganteum*), and it was by far the largest of any of which I have been able to find measurements.—*C. E. Bessey, Amer. Naturalist.*