FIRST IMPRESSIONS OF THE ECLIPSE OBSERVATIONS.

It is of course too early to expect any strictly scientific or conclusive estimate of the bearing of the eclipse observations on current solar theories, there having been no opportunity for a critical study and comparison of the photographs and other records obtained. Yet the impressions made upon the observing astronomers by the more striking phenomena are not without interest. How far the dissimilarity of the results from those obtained at previous eclipses is to be attributed to the markedly quiescent condition of the sun's atmosphere at this time, how far to the circumstance that most of the observations were made through the thin clear air of high Rocky Mountain regions, and how far to hitherto unsuspected changes going on in the sun, remain for solar experts and future observations to determine.

As regards the constitution of the corona, the results, Dr. Draper says, were entirely unexpected. Owing to the absence of great eruptions on the sun, that observer concludes that a true or normal spectrum of the corona was obtained for the first time. Consequently the luminous gases formerly discovered therein, particularly that giving the bright green line 1474, must have been temporary or accidental and not essential elements of the corona. His spectrum photographs showed that the light of the corona was derived solely by reflection from the sun. Prof. Barker's analyzing spectroscope bore the same testimony, as likewise did Prof. Morton's observations with the polariscope.

Touching the effect of the varying constitution of the corona, Dr. Draper said to the *Herald* correspondent:

"It is rather singular while the sun has been in such a quiescent condition for more than two years that we have not seen more changes in the climate of the earth. This would seem to show that the abnormal condition of the sun at the maximum period of sun spots, which occurs every eleven years, counts for but little against the total amount of heat that is sent out from the sun at all times. The present observations go to show that the activity or quiescence of the sun makes no perceptible difference in the earth's condition. I do not regard this most marked change in the corona as portending any change in the condition of either climate or crops."

Mr. Norman Lockyer interprets the evidence very differently. He says: "The present eclipse has accomplished, if nothing else, the excellent result of intensifying our knowl edge concerning the running down of the solar energy. With the reduction of the number of spots or prominences for the last four years, the terrestrial magnetism has been less energetic than it has been for the preceding forty years. This would evidently account for it, as well as for the great famines in India and China which took place forty-four years ago. The sun is the great prime mover of earth. Every cloud, every tide, every air current depends upon it. Its present quiet condition indicates great heat on earth. When in a state of activity the sun throws out an atmosphere which serves as a shield to the earth, protecting it from abnormal influences of the sun. The absence of the green lines shows a great reduction in the temperature of the sun, and such a marked change in the sun should produce a corresponding change on the earth. A continuation of this changing of the sun's condition must inevitably be followed by serious results and radical climatic variations."

President Morton says that the marked changes in the sun's condition would seem to call for corresponding marked changes in the condition of the earth, and it is a surprise that no such changes have occurred.

He is of opinion, however, that the evidence tends to sustain the theory that the sun's heat is maintained by the impact of meteoric matter, which is known to vary largely in constitution, and it is possible that the sun's fires may be fed at times with purely mineral matter, and again for considerable periods with meteorites highly charged with hydrogen, giving the sun a far-reaching atmosphere of the ignited gas. "If such changes go on indefinitely it may not be irrational to inquire whether they may not in future produce such extraordinary climatic conditions in the earth as geology teaches us have existed in the ages of the past, or, in other words, the polar regions become tropical, as the fossil remains of animals and plants found there indicate they have been."

Mr. Cowper Ranyard, while recognizing the marked changes in the sun's atmosphere, does not anticipate any great effect from them on that of the earth. Prof. Young agrees with Dr. Draper and the rest in thinking that Mr. Lockyer exaggerates the effect of coronal changes upon the earth's climate. So apparently does Prof. Newcomb, who does not expect from the results obtained any upsetting of well-founded current theories or the establishing of any strongly based new ones.

Lockyer's Report of the Eclipse of July 29, 1878.

The English astronomer, J. Norman Lockyer, sums up the results of the eclipse observations, in a dispatch to the London *Daily News*, as follows:

"The eclipse has been most satisfactorily observed at all the Northern stations, and at all the Southern ones from which news has been received up to the present time. The corona was markedly different from those observed in 1869, 1870, and 1871, and this year's observations have demonstrated the great variation in the structure and condition of the sun's outer atmosphere, when there are most and fewest spots on his disk. The corona was small, of a pearly luster, and the indications of definite structure were limited to two portions. Several long rays were seen, and Newcomb, who had erected a screen on a high pole, thinks he detected the zodiacal light extending 6 degrees from the sun. Draper, who used a Rutherfurd grating two inches square, and a camera of large aperture, and Lockyer, who placed a small grating in front of an ordinary portrait camera, both obtained photographs of the spectrum of the corona. A continuous spectrum only was recorded, and in ordinary spectroscopes the bright lines usually seen were altogether absent. Lockyer, who observed with a simple grating, saw no rings. All these are so many indications of a wonderful change since 1871, and there is great probability that the substance which gives rise to the continuous spectrum is not that which produces any of the lines. Newcomb's party and Barker made careful search for dark lines in the corona, but none were observed. Young has telegraphed that there were no lines observed in the ultra violet at Denver. It would appear, therefore, that he also has obtained photographic evidence of a continuous spectrum. The radial polarization observed in 1871 has been confirmed by Holden. A new use of the eclipse has been introduced on this occasion. Newcomb, Watson, Holden, and others have included a search for intra-Mercurial planets in their programme, and Watson has been fortunate enough to detect a body of four and a half magnitude near the sun, which is certainly neither a known star nor a planet.

"Every facility has been afforded to the astronomers, and a fourth station along the northern line crossing the belt of totality was at the last moment organized by the Union Pacific, a traveling photographic car being run to a point between the eclipse camps at Separation and Creston. The tasimeter, the new instrument on which Edison has been working unceasingly here, has proved its delicacy. During the eclipse he attached it to Thomson's galvanometer, which was set to zero. When the telescope carrying the tasimeter was pointed several degrees from the sun, the point of light rapidly left the scale as the corona was brought upon the fine slit by which the tasimeter itself was protected. There was no chromosphere to speak of, and only one prominence, like the horn obscured in 1868, but very dim."

Ink Printing from Glass Negatives.

To make negatives capable of being printed from they must be coated with a solution of chromatized gelatine, but only after they are perfectly dry. By this means a layer of chromatized gelatine is deposited over the collodion film. But it is well known that when such negatives are exposed in diffused light the lines become broader than they should be, because the light, even with thin films, can act sideways. In order to obviate this I tried to form a film of chromatized gelatine in that of the collodion negative, and I was fortunate enough to be completely successful. The method that I adopted was to fix the negative immediately it was taken, without first drying, then to wash it with water, and while still wet to immerse it in a dilute solution of chromatized gelatine. When dry, the surface was quite dull, without any sign of gelatine upon it; the collodion film had, notwithstanding, absorbed sufficient chromate and gelatine to be capable of printing from after exposure.

The best method of obtaining these plates with what may be called a typographical collodion film is as follows: First take an ordinary but not an intense negative on an albumenized plate glass plate, fix it at once, wash it, and then plunge it into the gelatine solution, which should be prepared in the following way: 4 to 5 parts of gelatine are allowed to soak and swell up in water, the excess of fluid is poured off, and the remaining gelatine dissolved in 50 parts of distilled water; then a solution of 5 to 5 parts of ammonium bichromate in 100 parts of water are added, and the whole is heated to 75° C. In this bath the plate must remain for about five minutes. When large plates are used, the solution may be flowed over them, taking care to wash them rapidly with warm water beforehand. In this case too it is necessary to repeat the coating with chromatized gelatine several times. After the plate has taken up a sufficient quantity of the solution it is placed in a horizontal position and heated over a spirit lamp. Should fumes come off, the plate must be held upright for a minute or two, and again laid horizontal, and further heated until it is quite dry. It should not be made hotter than the hand can bear when passed over the reverse side.

For negatives of this kind the time of exposure cannot be accurately determined by the eye, nor can it be measured by the ordinary photometer. I overcame this difficulty by first well wiping the prepared negative on the reverse side, and then laying on the film side a small piece of albumenized or chromatized paper, exposing the whole in a frame on the reverse side to the light. By aid of this simple expedient the action of the rays of light can easily be watched, so that places which are too dark can be covered, and all the other articles used which are common in silver printing. Commonly a black support is employed to avoid the reflection of light, but in this process, as I have described it, reflection need not be feared, notwithstanding the white albumenized paper, for the silver chloride absorbs all the rays of light.

As soon as all the finest lines of the image are distinctly visible, the ammonium chromate must be washed out by dipping the plate into cold water; the plate can then be dried, and placed in the hands of the printer. The finest rollers must be used for printing. When the plate is damped I would recommend that a little gum arabic be dabbed on the edge, and rubbed over the surface of the picture. As regards the production of the negative, I should observe that it is not every collodion which will take up the chromatized gelatine; there are collodions which will not absorb the gelatine at all, so that a layer of chromatized gelatine merely is obtained on that of the collodion. The lithium collodion, prepared by Kurz, of Wernigerode, is best adapted for this purpose. Probably the lithium salt in this collodion plays no unimportant part in the reaction, but I have not had an opportunity of making experiments on this point.—*Hans Brand, in Photographische Correspondenz.*

Objections to Helmholtz's Theory of Vision.

The majority of the physiologists of the present day share the opinion of Helmholtz, who explains the possibility of seeing at different distances by changes of form in the crystalline lens; the latter becoming more convex when near objects are looked at, and on the contrary flattening when those at a distance are regarded. M. Fano, in the current number of *Les Mondes*, opposes some very grave objections to this theory; among these, the following:

1. It is possible for certain persons who have been operated upon for cataract by extraction, to see near and far with the same pair of spectacles; that is, with glasses of short focus.

2. The crystalline lens is too dense to allow of its readily taking such modifications of form.

3. The weakness of the muscular organ (ciliary muscle), which is regarded as the agent designed for producing such modifications in the lens.

4. The excessive fatigue to the eye which would result from these incessant contractions of a very weak muscular apparatus, should the lens really change form, from morning till evening, during the exercise of vision on near and distant objects.

"Is it absolutely necessary," he asks, "that changes of form in the refracting apparatus of the eye should take place in order to see near and distant objects clearly? If the eye were a simple optical instrument, it would be necessary to answer this question in the affirmative. But the eye differs from an ordinary optical instrument in this, that the screen of the camera obscura (which the organ resembles as a whole) is not an inert membrane, but on the contrary an organized living one—the retina. Now the existence of such a screen as this must modify, not the mode of formation upon it of the image of exterior objects, according to the distance at which such objects are placed in relation to the eye, but rather the conditions of impression and sensation of these images.

"In effect it is not indispensable in order to see objects that their image should be sharply defined on the retina; that is, that all the luminous rays coming from the same point of the object should unite at a common focus in the retinal layer of rods and cones. Vision still takes place, the eye sees, even when this focus is formed behind or in front of the rod and cone layer of the retina; that is to say, when circles of diffusion are formed on this layer. A very simple experiment will serve to demonstrate this fact: Place a printed page for reading at a distance of 12 inches from the eye; now gradually bring it nearer the eye of the subject, and the latter will still be able to read up to a certain distance, although the printed characters are surrounded by a halo, thus indicating that the image of these characters is forming on the retina a circle of diffusion, and not a sharp image.

"So in order to see it is not necessary that the image of exterior objects should have its focus on the retinal layer of rods. But in this case the impression is less active, because all the luminous rays from the same point of the object unite in less numbers upon the same cone of the retina. If, then, the impression is less active, the sensation is also less powerful and vision is less clear."

The Famine in Northern China.

The horrors of the Chinese famine are impossible to describe, and happily inconceivable to American minds. At a recent meeting in Dublin, Sir Thomas Wade, British Minister to China, said that five provinces, covering an area of 395,000 square miles, with a population of over 120,000,000 (three times that of all the United States), have been so stricken with drought that the ordinary sources of food have been almost entirely dried up, reducing to a state of starvation not less than 15,000,000 people. Not long since the *Christian Union* published a letter from China, in which it was stated, on the authority of the Governor of Shansi, that the number already starved and frozen was estimated at 6,000,000. Whole villages had been depopulated: dogs and fowls and every living thing but crows and carrion birds were dead. "The London estimate that 70,000,000 have perished is no exaggeration, but those actually waiting for death by starvation, more or less prompt, are still 10,000,000 perhaps, of whom relief will be too tardy to save perhaps 2,000,000; while, if the rains are denied in Shansi, Honan, and Shensi again this spring, nothing but foreign or Divine interposition will save 10,000,000 people from death."

Substantially the same testimony is borne by a gentleman holding an official position in Peking, in a letter to the Boston *Journal*. The sale of children and kindred for food has been going on for some time, and cannibalism has been largely resorted to. Had the drought occurred in Southern China there would be less difficulty in relieving the famine, owing to the abundance of water communication. In the north, however, there are no such means for meeting the emergency, there being only earth roads, and those indifferent.