but this is just the opposite of the result of the eclipse observations. Furthermore, Plate III., 'Pressure in Eclipses,' shows us the variations in pressure as observed, and these are reproduced in the lowest section of the adjacent diagram. It is seen that the pressure in the eclipse is *reversed throughout its length to that required in the cold-center cyclone.* The Weather Bureau observations at sixty-five stations confirm the Clayton distribution of pressure, but the conclusion is also unavoidable that we are not dealing with a cold-center cyclonic circulation. My further remarks on this subject will be found in the forthcoming report by the Weather Bureau.

3. *The Semidiurnal Cyclones.*—Even if the analogue between the eclipse circulation and that assumed to exist in the nocturnal circulation were not hopelessly in error, there are yet other difficulties to be considered, even supposing the cooled hemisphere of the atmosphere were to produce something like a cold-center cyclone and the heated hemisphere a warm-center cyclone. (*a*) The vertical circulation in the cold-center and in the warm-center cyclones are in *opposite directions* to one another at the belt of highest pressure, so that they would tend to destroy each other, rather than build up any high pressure belt such as the diurnal pressures require. (*b*) If there is a cyclonic circulation of any kind, the conditions demand that the pressure be distributed quite symmetrically on all sides of the center in order to maintain a true gyratory motion; but in the diurnal barometric pressure there are found to be simply two peculiar waves extending from pole to pole, which do not in the least form such a symmetrically distributed pressure about a center. Compare Int'l Cloud Report, Chart 44. (*c*) According to Clayton, Plate IV., the high pressures at the surface shift about 90° in the higher strata. But so far as I know, the only data bearing upon this point are contained in the Blue Hill hourly cloud observations, and these show that the *same diurnal circulation* exists in the atmosphere from the surface to the cirrus level. However, this may be a doubtful point and I will not press its accuracy. Compare Int'l Cloud Report, Chart 45.

I have generally found myself in accord with Mr. Clayton's published results, and I am sorry to be obliged to dissent from his interpretation of the eclipse observations in this case. The variations of pressure in the eclipse are not larger than 0.01 inch of mercury, and the velocity of the eclipse wind is only 2 or 3 miles; but it would seem hardly credible in the face of these facts that this small atmospheric disturbance should set up any true cyclonic circulation over an area 5,000 miles in extent, as is claimed in the report under consideration.

FRANK H. BIGELOW.

WASHINGTON, D. C., March 20, 1901.

THE REVERSAL OF THE PHOTOGRAPHIC IMAGE BY CONTINUED ACTION OF LIGHT.

THE remarkable results described by Professor Francis E. Nipher, in developing photographic plates in daylight, bring to mind some of the earlier experiments upon the reversal of the photographic image. It has long been known that under particular conditions of over-exposure in the camera a positive, instead of a negative, is produced by ordinary development. This result has been repeatedly observed by amateurs, much to their astonishment and mystification.

The present writer has several times attempted to bring about the effect by prolonged exposure in the camera, but without success. The necessary conditions not being known, the result is accidental and uncertain. The idea of giving a supplementary exposure of the plate in broad daylight did not suggest itself; indeed, it is not one that would spontaneously commend itself to a photographer. All his previous training and experience is opposed to it on general principles.

Nevertheless, it is not entirely new. Herschell, in the year 1839 or 1840, did very much the same thing. He observed reversals of photographic action, and so did Draper on strips of sensitized paper with which he was studying the chemical action of the sun's light in Virginia, and photographing the spectrum in ephemeral colors. This subject was referred to quite recently in an article by the present writer, entitled, 'Tithonic Rays and Early

Photographs in Color,' published in the *International Annual of Anthony's Photographic Bulletin*, XIII. (1901), 107. At that time and also many years later, the effects observed were attributed to an antagonistic action between light radiations from different parts of the solar spectrum.

Many years ago, when collodion wet plates were mostly in vogue, there was considerable discussion among photographers of the effect of exposing sensitized plates to diffused daylight, either before, during or after the usual exposure in the camera. Some claimed that such a supplementary exposure made the plates more sensitive, so that the camera time was materially shortened. The admission of a little diffused light through a hole in the camera was claimed to be advantageous in the same way. Others questioned the utility of the practice and the question was finally dropped and forgotten.

There may have been a basis of truth in the contention of those who advocated the supplementary exposure, but it was not satisfactorily established at the time. There is less reason for skepticism now than there was in those days. Although not exactly in line with Professor Nipher's work, the subject bears a close relation to it.

More directly connected with the recent observations is the work of M. J. Jansen, at Meudon, in the year 1880, when he was engaged in studying the solar radiations. In his original communication to the French Academy, published in *Comptes Rendus* of that year, he used the following language descriptive of his work: "I have the honor to inform the Academy of the discovery of a fact to which I have been led by my studies in the analysis of the light of the sun and of its photographic images.

"This fact consists in this, that the photographic images may be reversed, and pass from negative to positive by the prolonged action of the light which has produced them."

Ordinarily the exposures for negatives were about one-thousandth of a second, or when bromide plates were used, one ten-thousandth. But when the exposures were prolonged to half a second or a full second—increased 10,000 or 20,000 times—he obtained a positive picture instead of a negative.

The investigations were continued and in a second communication to the Academy, also published in *Comptes Rendus* (Vol. XCI.), he made known some remarkable results.

By varying the times of exposure he found an intermediate condition of the plate at which neither a positive nor a negative could be developed. His conclusions may be briefly summarized here. With exposures of increasing duration he discovered six different successive conditions of the sensitive plate. These developed in order as follows:

1. A negative. The ordinary negative.
2. A first neutral condition which blackened uniformly in the developer.
3. A positive.
4. A second neutral condition, opposed to the first, which became uniformly lighter in the developer.
5. A second negative, similar to the first but differing by the enormous amount of light required to produce it.
6. A third neutral condition, in which the negative of the second order had disappeared and was replaced by a sombre, uniform tint.

These facts were established with different kinds of plates—tannin plates, gelatin-bromide and others.

It is scarcely necessary to indicate the bearing of these observations on the results of Professor Nipher's experiments. Does not the fourth condition suggest that if a plate in that stage were developed in a lighted room it would show a negative picture?

About the time of these observations of Jansen, considerable attention was being directed to the subject of reversals of the photographic image; but most of the literature deals with theories in explanation of the facts. Although the discussion was sufficiently instructive and interesting, it does not seem to me that we are sufficiently acquainted with the chemical effects of light in photography to warrant much chemical theorizing in this particular field.

Romyn Hitchcock.

New York, March 18, 1901.