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Dated 9 Sept 98

[Despatch Abstract.]

Eclipse of the Sun
Forwarding to the Govt of India, Surgeon
Major Van Geygheli's report on the photo-
-graphic work at the recent
with the addendum by the Govt Astronomer

11/9/98

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Enclosures

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G.O., &c., Nos. 1150, 1151, 9th September 1898.

SEPTEMBER.

Eclipse of the Sun.

Forwarding to the Government of India Surgeon-Major VanGeyzel's report on the photographic work at the recent — with the addendum by the Government Astronomer.

BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.
Cnr 3158/25 (977)							

GOVERNMENT OF MADRAS.

PUBLIC DEPARTMENT.

READ—the following paper:—

From C. MICHIE SMITH, Esq., Government Astronomer, to the Chief Secretary to Government, dated Madras, 11th August 1898, No. 149.

In continuation of my letter of 15th June 1898, No. 117, I have the honour to forward a report on the photographic work at the recent eclipse received from Surgeon-Major VanGeyzel. This report, which has been delayed owing to his serious ill-health, is of considerable value, and I have the honour to request that it may be added to the report already sent in.

2. I send also a small *addendum* on a point that was overlooked in my report.

ENCLOSURE.

Report by Surgeon-Major J. L. VanGeyzel on the Photographic Operations.

I arrived in Sabdol four days before the eclipse, and as "Mount Sabdol" was still under construction the dark room which was part of the 40 feet instrument was at this stage a leaky grass hut, letting day light in on all sides. As nothing could be done to it until the 40 feet instrument was got into working order, the first two days were fully occupied in unpacking the cases of photographic plates, chemicals and dishes, &c., in sorting and arranging things, and in making up the requisite solutions. Funnels, filter papers, and measure glasses we had brought, while baskets, jugs, basins and empty bottles for dissolving, filtering and stocking the bulky solutions, were requisitioned on the spot. Water was conveyed in pots from a stream about three-quarter of a mile away. It was fairly soft, and after coarse particles had been allowed to subside, the supernatant liquid was found to be free from dust and fit for all subsequent operations without filtration. On account of the presence of alkalis in solution, it deposited a slight precipitate on the plates after they had been alumed. This drawback was however of slight consequence, for the precipitate could be easily removed by sponging with wet cotton wool before the plates were set up to dry.

At the bottom of the 40 feet tube was the dark room in which the plates were to be first exposed during the eclipse and to be afterwards developed. Considering that the available working space within was only 8' x 8' x 7', it was not an easy matter to fit it up, so that it might do duty for both purposes without unduly hampering one or other sets of operations. The developing table was improvised by hammering four posts into the ground and nailing the cover of a packing case on them; a zinc-lined box, in which plates had arrived from England, similarly fixed answered the purpose of a sink, the waste water being led out through a thin bamboo inserted into a hole in the bottom of the box. A cask of water stood, elevated upon boxes, outside the dark room, and from it a bent pipe was introduced through the wall of the dark room, the end of the pipe over the sink being plugged with a cork. Such primitive arrangements as these required the presence of an assistant in the dark room during the development of the plates, and I was greatly indebted to Mr. H. Kelsall Slater for his ingenuity and willingness in the assistance which he rendered to me throughout. The dark room was lit through a window about 15 inches square, which was covered with two layers of orange fabric nailed across it and a third layer hanging as a moveable curtain. The developing table was opposite the window, so that the operator stood with his back to the window and the plate under development was in his shadow. The dishes for the 18" x 18" plates were tinned iron, painted with Aspinall's bath enamel white paint, and they served their purpose excellently. A card board cover for the developing dish was improvised on the spot from the packing materials.

My duty during the eclipse was to expose the 18" square plates in the dark room at the bottom of the 40 feet tube. The period of totality at Sabdol was calculated to be 104 seconds and the programme of exposures given to me by the Government Astronomer was as follows:—

No.	Plate.	Exposure. SECONDS.
1.	Wratten and Wainwright's drop shutter	1
2.	Imperial special rapid	1
3.	Wratten and Wainwright's drop shutter	2
4.	Imperial special rapid	4
5.	Do.	10
6.	Do.	5
7.	Do.	2
Total ..		24½

leaving 79½ seconds for changing the plates, i.e., an average allowance of 13½ seconds between each exposure. The intervals actually available were less than this, because 10 seconds were allowed after the 5th exposure to enable Mr. Slater (who kindly undertook the exposure of the last two plates so that I might get a sight of the eclipse) to enter and me to leave the dark room. This reduced the period available for the changing of the plates to 69½ seconds, i.e., an average of a little over 11½ seconds between each exposure—an interval which was just long enough (certainly not too long) for the maneuvers which had to be performed with such large and heavy plates. Had the plate-holder, which had been specially devised by Mr. Michie Smith, arrived in time, a large number of exposures could have been given with much greater ease in the manipulations. Owing to the delay in the arrival of this plate-holder, Mr. Michie Smith had light tight blackened teakwood boxes made, in which the plates were exposed by lifting off the lid—an operation which even in the very best hands is attended with the risk of moving the plate during its exposure. It was a most serious handicap on the workers, and no doubt a source of additional anxiety to the Government Astronomer, who had anxieties enough without it. There were seven of these boxes each containing a plate, they were stood up vertically (in the correct order of exposure) upon the floor, to the left of the shelf on which the plates were to be exposed. The order of drill was as follows:—The box containing plate No. 1 was placed on the shelf and correctly centred by sliding it to the left until it rested against a ledge. The subsequent maneuvers in each interval of 11½ seconds consisted in loosening and partially lifting the lid clear of the box, holding it for an instant close to and in front of the box—this was done to ensure that no movement of the plate took place by contact of the lid with the box at the moment of uncovering—then making the exposure by lifting the lid away over the left shoulder, replacing the lid at the end of the exposure, closing it securely, lifting the plate box off the shelf and placing it on the floor to the right of the shelf, then picking up the box containing plate No. 2, centering it on the shelf, and repeating the maneuvers. It required many rehearsals to acquire sufficient dexterity to perform these manipulations in a limited working space and to complete the correct exposure of all the plates within the available time without accidental movement of any of them. To enable me to see something of the eclipse, it was arranged that Mr. Slater should come to the door of the dark room and at the 60th second he was to call to me "are you ready". This was calculated to take place towards the end of the exposure of plate No. 5. He was to remain outside until he received the answer "yes", which I was to give after I had secured and put away plate No. 5. He had then to slip into the room and stand against the wall behind me while I slipped out; and from that stage he had charge of plates Nos. 6 and 7. Needless to say that the whole performance was rehearsed over and over again until absolute certainty was attained; it was also repeated at night so as to be prepared for a dark eclipse. Mr. Slater and I acquired such precision and dexterity that in our final rehearsals we had usually about 2 seconds to spare at the end. In spite of all these careful rehearsals, the performance during the eclipse was less brilliant, for when Mr. Slater called to me at the 60th second, the exposure of plate No. 4 only had just been completed. Now deducting 7½ seconds (the actual exposures given to the first four plates) from 60 seconds leaves 52½ seconds as the time occupied by me in changing 3 plates, i.e., an

average of $17\frac{1}{2}$ seconds for each change instead of $11\frac{1}{2}$ seconds as at the rehearsals. I confess that I was all the time conscious of a tardiness, or I should say deliberateness, in my movements chiefly from a desire to avoid hurry during so critical a period; and I can only attribute the delay which occurred to this desire. Recognising at the moment that I had lost time, I hurried the maneuvers for plate No. 5, exposed it correctly and gave the word "yes" to Mr. Slater at the 80th second instead of at the 64th second, having lost 16 seconds altogether. Allowing 10 seconds for us to exchange places and another 10 seconds for Mr. Slater to place plate No. 6 in correct position would bring the time up to about the 100th second as the moment at which the exposure was commenced of plate No. 6, which was to receive 5 seconds. The result shows that totality was over and that the limb of the sun appeared towards the very end of the exposure (probably during the last second). Plate No. 7 was also exposed, although totality had passed.

I therefore saw only the last 14 seconds or so of the total eclipse, and the general impression which it produced upon me was disappointing, as it appears to have been upon many others. When I emerged from the dark room I was amazed at the amount of light, having expected almost complete darkness; the landscape appeared as when viewed through deep neutral tinted spectacles. The appearance of the sky around was leaden, while near the eclipsed sun it was filled with brilliant radiance. I had just begun to realise the presence of streamers of brilliant light from the coronal margin, when the words "all over" were given out.

The development of the plates was my next duty and was taken in hand immediately after the eclipse. All the plates were developed with pyrogallie acid and sodium carbonate, with such modifications in the strength of the developer as secured suitable to me for obtaining the results wished for. The amount of pyrogallie acid never exceeded 2 grains to the ounce of developer, the proportion of anhydrous sodium sulphite to pyro. being as 4:1; the proportion of potassium bromide was constant throughout, viz., $\frac{1}{2}$ grain to each ounce of developer; while the amount of sodium carbonate (cryst.) varied from 10 to 30 grains per ounce of developer. The freshness and splendid condition of the emulsion coating became evident on developing the first plate, and I had no hesitation in forcing the plate, which received the longest exposure, with such freedom from fog as could not be obtained upon plates usually met with in the Indian market. I must confess that from previous experience, I was somewhat anxious as to the behaviour of the gelatine on the Imperial plates, but with water so much cooler than we have in Madras these plates behaved admirably, even though they were treated with a large proportion of alkali than would have damaged most films. Plates Nos. 1 and 2 having received short exposures were expected to show only the prominences and the inner corona. They were accordingly developed with 2 grains of pyro. to the ounce, requiring altogether, in instalments, the minimum dose of alkali previously mentioned. When no more detail was forthcoming the development was stopped, the object being, as in all the subsequent plates, to keep the deposit fairly thin and to preserve as much as possible the gradations of light. The remaining five plates were all developed tentatively, the objects aimed at being (1) to prevent blocking up of the strongest lights of the prominences and the inner corona and (2) to obtain as much detail and extension of the rays and streamers as possible. To secure these ends each plate was developed with a developer weak in pyro. and in sodium carbonate, beginning with $\frac{1}{2}$ grain of pyro. to the ounce of developer. As the solution got discoloured and exhausted it was replaced with fresh weak pyro. solution feeling my way along (so to speak) with the alkali. When the film yielded all it could be made to do with gradually increasing doses of alkali, the plate was washed and it was then rocked in the normal developer for a few moments. When the desired strength was obtained in the weak lights, the plate was washed and fixed. Plates Nos. 6 and 7, exposed after totality was over, and on which the sun's limb had flashed, were developed with a developer weaker still in pyro., and the results are, I think, such as could scarcely have been obtained by any other method of development. It is needless to say that the tentative method of development entailed an enormous expenditure of time over each plate and the physical exertion of manipulating these large plates was most tedious. To handle such plates without inflicting some damage on the film is a troublesome matter at the best of times; but to manipulate them in such a small working space is a condition under which I shall never

wish to repeat these experiments. The anxiety is too great and even in the very best hands the odds are in favour of accidents. That no damage occurred to any of these plates in the dark room was as great a piece of good luck as ever befell me. A sufficiently roomy and properly arranged dark room is an absolute necessity where so much depends upon the results of operations conducted inside it. Not only this, but the photographer, who in an expedition of this nature, is expected to turn out the very best work that he can, should not be grudging any time for the development of the plates. His most important duties only begin when the eclipse is over. The development of the seven large plates occupied the remainder of the day on which the eclipse occurred and the whole of the next day; and I was then obliged to leave that very evening in order to rejoin my appointment in Madras within the period of my deputation. I was obliged to take with me, for development in Madras, the ten quarter plates which had been exposed in the 5 feet instrument. Needless to say that at the end of a $3\frac{1}{2}$ days dusty journey these plates were not quite in such good condition as they might have been, had there been time to develop them at Sabdol. I was obliged to put those plates aside, in order to attend to my own pressing duties, after I arrived in Madras, and the plates had to be developed during the intervals of other work. The results are not technically equal to those obtained on the large plates which were developed at Sabdol. The $\frac{1}{4}$ plates included Wratten and Wainwright's special drop shutter, Edward's isochromatic and the Sandell triple-coated plates. They were each developed in accordance with the maker's formulae, the isochromatic plates being dealt with in covered dishes at a distance from a small deep, red window, which was only uncovered for examination of the plate.

My next duty consisted in making a series of transparencies from each of the seventeen negatives. This was done by copying them upon Ilford lantern plates. At this stage I was obliged to leave Madras for England on sick leave.

Addendum by the Government Astronomer, dated 10th August 1898.

During totality a plate was exposed for 60 seconds on a general view of the camp. At 35 minutes after sunset another plate from the same packet was exposed on the same view under identical conditions as to stop, exposure, &c. The two plates were developed together in the same dish and for the same length of time. The results showed that the illumination of the scene by the corona during totality was considerably greater than the illumination by the twilight 35 minutes after sunset. The night was clear and cloudless and the sun at the time of exposure was about $6\frac{1}{2}^{\circ}$ below the horizon.

ORDER—No. 1150, Public, dated 9th September 1898.

Surgeon-Major Van Geyzel's report on the photographic work at the recent eclipse of the sun, with the addendum by the Government Astronomer, will be forwarded to the Government of India.

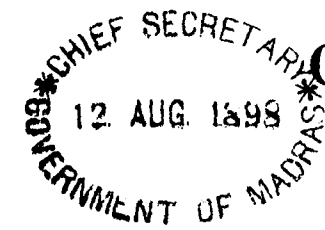
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To the Government Astronomer.
ENDORSEMENT—No. 1151, Public, dated 9th September 1898.

Copy to the Government of India, Revenue and Agricultural Department, in continuation of endorsement No. 980, Public, dated 24th July, 1898.

G. STOKES,
Chief Secretary.
Ed. C. M. Thambusamy

Public (1898) Department.



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Madras.

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from Surgeon Major Van Gyzen.
with the request that it may
be added to the report already
sent in.

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Order

SUBJECT.

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ORDER No. 1150. D 9th Sept 1898
A

Surgeon Major Van Geyzel's re-
port on the photographic work at the
recent eclipse of the sun, with the
addendum by the Govt. Astronomer, will
be forwarded to the Govt. of India.

To

The Govt. Astronomer

Endorsement No. 1151. D 9/9/98

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