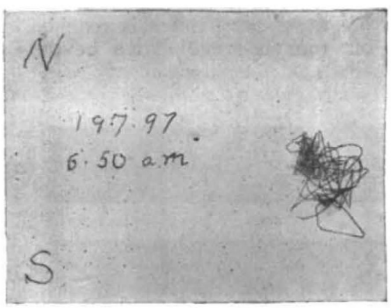
small portion of the crops has been destroyed by sand and mud, but nothing like the amount that was supposed at first. Here every house and structure that was built of stone was simply shaken to pieces; but the buildings were never intended to stand earthquakes, and when one sees the kind of structures they are, great shapeless lumps of stone laid in very inferior mortar, one is not surprised that they all came down, though it is doubtful whether the best of masonry would have stood the shock. In the cemetery huge slabs of granite or marble have been jerked several inches out of their places. It has been most interesting work investigating the results of the shock. I have not yet heard what opinion my colleagues, who have gone out in various directions to make observations, have formed about the cause of the shocks; but my own opinion is that they are due to movement along a line of fault running along the southern side of the Khasia and Garo Hills, from near Cachar on the east to and beyond the Bramahputra. If you look at the map of Assam you will see that the southern boundary of these hills is a very straight line. The rocks are bent down suddenly along this line in a uniclinal curve, and to the south of it the plains of Sylhet and Lower Bengal are certainly a region of subsidence. If I should prove to be right, it will be a most interesting case of earth-movement on a large scale. I believe also that the 'Barisal guns,' which have been a puzzle for so many years, are connected with the same movement, and are caused by slight slips, not sufficient to cause actual shocks of earthquake. The sounds one hears here, sometimes accompanied or followed by a shock, but sometimes also without any shock, are exceedingly like the 'guns.'

"At the beginning of the week I put up here a roughly constructed seismograph for observing the shocks, which still continue, though they are gradually getting less violent and less frequent than at first. The instrument is in principle, I believe, due to Prof. Ewing, of Tokio, and gives a trace of the horizontal movement of a point on the surface of the earth on a piece of smoked glass. From this it is easy to take prints on a piece of sensitised paper, and I send you some of the results [one of the prints is here reproduced] I have already obtained. The trace is magnified 6·7 times by the instrument, so that one can form an idea from it of how exceedingly minute the actual movement of the surface is, and yet the two taken in the morning of the 19th were fairly severe shocks. The first, at 1.39 a.m., was a very sudden bump, and was soon over; but the other, at 6.50 a.m., lasted some fifteen to twenty seconds. This instrument cost altogether about 6*d.* to put up; I am making another rather more carefully, which will be looked after by the Public Works Engineer here when I leave.



"The house I used to live in is perfectly flat on the ground. It is wonderful that so few people were killed; but the first shock came at a time of day when most people were out of doors, and only two Europeans were killed and about ten natives, who were all in the Government Press building, the only house of more than one story in the place. If it had happened at night, or at the same time next day, when many of the people would have been at church, there would have been great loss of life. I am going on from here to Cherrapungi, where the damage has been very great, chiefly caused by landslips, and then back to Calcutta through Sylhet."

The Centipede-Whale.

I AM very much desirous of being informed by you, or some of your readers, what animal is meant by "Scolopendra Cetacea," which, according to Johnston, has only been described by Ælian: "Scolopendrae vim et naturam, . . . quoddam etiam maximame cêtos marinum eam esse audivi, quam de mari tempestatibus in litus expulsam nemo foret tam audax, quin aspicere horreret. Ii verò qui res maritimas percallent, eas inquiunt toto capite spectari eminentes è mari: et narium pilos magna excelsitate apparere, et ejus caudam similiter atque locustae latam perspici: reliquum etiam corpus aliquando in superficie aequoris spectari, idque conferri posse cum triremi instae magnitudinis, atque permultis pedibus utrinque ordine sitis, tanquam ex scalmis appensis, natare. Addunt harum rerum periti ac fide digni, ipsos etiam fluctus ea natante leviter subsonare." ("De Natura Animalium," lib. xiii. cap. 23.) In Gesner's "Historia Animalium," lib. iv., Francfort, 1604, p. 838, a figure is given of this animal said to have been seen in India.

That the Japanese of old had some notion of such an animal is well shown in Kaibara's "Yamato Honzô" (1708, tom. xiii. f. 41, b.), where it is said: "The *Mukade-Kujira* [=Centipede-Whale] is as large as a whale, and has five fins on the back and a two-cleft tail. Its legs number twelve, six being on each side; its flesh is coloured red and very venomous, man being killed when he eats it."

Here I may add that Olaus Magnus's "Cetus Barbatus," which is assimilated with the "Scolopendra Cetacea" in the book of Gesner (*ut supr.*, and figured on p. 207), appears to be but an exaggerated portrait of some huge Cephalopod; and also that I was lately told by Captain Miura, of the *Fuji*, of his having experienced a serious illness in consequence of eating flesh of a gigantic cuttlefish in the Pacific Ocean.

KUMAGUSU MINAKATA.

15 Blithfield Street, Kensington, W., August 30.

THE APPROACHING TOTAL ECLIPSE OF THE SUN.[1]

VI.

IN the third article under the above heading, when referring to the suggested programme for the observations of the next eclipse, I stated briefly the divergent views held with regard to the true *locus* of origin of the absorption which produces the Fraunhofer lines. It is, I think, worth while to return to this subject in order that the results obtained from the double series of photographs obtained during the eclipse of 1893 may be indicated. I pointed out that in the photographs in question the radiation spectrum was most distinctly *not* identical with the Fraunhofer spectrum; the most important point being that some of the strongest bright lines do not appear among the dark ones in the solar spectrum, while some of the strongest dark lines are not seen bright in the spectrum of the stratum of vapours in immediate contact with the photosphere. The region covered by the diagram, given in my paper in the *Phil. Trans.*, lies between wave-lengths 4100 and 4300, but similar results follow when other regions are included in the inquiry.

These positive conclusions are not weakened by the consideration that the resolving power of the prismatic cameras employed in 1893 is not sufficiently great to show all the lines of the Fraunhofer spectrum, which is used as a term of comparison; in fact, working under exactly the same conditions as during the eclipse, the instrument employed in Africa only shows 104 lines in the spectra of stars resembling the sun, in the region *h* to H, in place of 940 given in Rowland's tables of lines in the solar spectrum. We, therefore, get a better term of comparison if we employ the spectrum of some star such as Arcturus, which closely resembles the sun. Such a comparison is shown in Fig. 24; out of 104 lines which the instrument is capable of depicting in the region *h* to H, only 40 are shown in the spectrum of the base of the sun's atmosphere. This comparison amply confirms the conclusion that the lines reversed at the beginning or end of totality, though fairly numerous, do not correspond in intensity, though some of them correspond in position with the dark lines of the solar spectrum, and consequently that the so-called "reversing layer" close to the photosphere is incompetent to produce, by its absorption, the Fraunhofer lines. Further, as previously pointed out, while the chromosphere fails to show most of the lines

[1] Continued from p. 395.

which are present in the Fraunhofer spectrum, it shows many bright lines which are not represented among the dark ones. This again indicates that the chromosphere is not the origin of the Fraunhofer spectrum

It is all the more important to call attention to the advantage we now possess in being able to directly compare photographs of the chromosphere obtained during eclipses with others of the spectra of stars resembling the sun, since, as I have already stated, if all goes well next year, double the dispersion utilised in 1893 will be employed. This is certain not only to enable us to obtain more accurate wave-lengths, but the number of Arcturus- and chromospheric-lines *obtained by the same instrument* will be very greatly increased.

In the meantime we must take the above as one of the most positive results secured in the eclipse of 1893.

The Spectra of Prominences at Different Heights.

There is another matter of almost equal importance in which the increased dispersion designed to be employed in 1898 will in all probability prove of the utmost value. I refer to the differences in the spectra as we work outwards from the photosphere.

The questions touching the spectra of prominences at different heights, which the prismatic camera enables us to study with minuteness, must really lead in time to a much better knowledge of the loci of absorption in the solar atmosphere. If we consider a prominence on that part of the sun's limb where the second contact takes place, the first photograph taken during totality will show the spectrum of the whole prominence, and succeeding photographs will give the spectrum of the same prominence with the lower parts gradually cut off by the moon's edge. In the case of a prominence at the opposite limb, similar sections will be represented in successive photographs, and the last photograph taken during totality will show the spectrum of the greatest part of the prominence.

Some of the 1893 prominences (Nos 3 and 19) have been investigated in this way, and particulars of their spectra at various heights recorded. The height above the photosphere, reckoned in seconds of arc and in miles, at which each spectrum is given, has been calculated. The relative intensities of the lines at different heights have been tabulated. In this way it has been found that some of the lines remain of the same relative intensity throughout all parts of the same prominence; others again dim rapidly in passing towards the upper parts, while some, but not so many, brighten.

The prominences are also seen to behave differently in respect to some of the lines; thus the line at λ 3856·5 disappears before a height of 2000 miles is reached in prominence No. 3, but remains visible at a height of over 4000 miles in prominence No. 19. Lines also occur in one prominence which do not appear in the other, *e.g.* λ 4313·2. Other differences are also revealed, but it may be remarked that too much stress should not be laid on the presence or absence of the very faintest lines in some of the photographs, as variations may be partially attributed to differences in the quality of the photographs, and also to the time of exposure and degree of development.

The changes in the spectrum of a prominence in passing from the top towards the base are illustrated in Fig. 25. Spectra *a*, *b*, and *c* represent the spectrum of Pro-

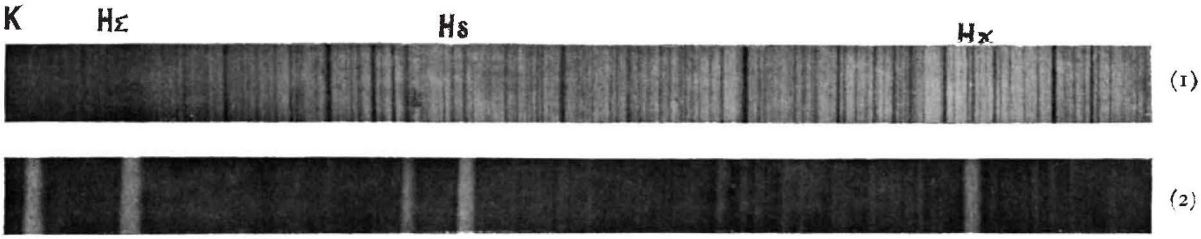


FIG. 24.—The spectrum of Arcturus (1) compared with that of the base of the chromosphere photographed during the eclipse of 1893 (2).

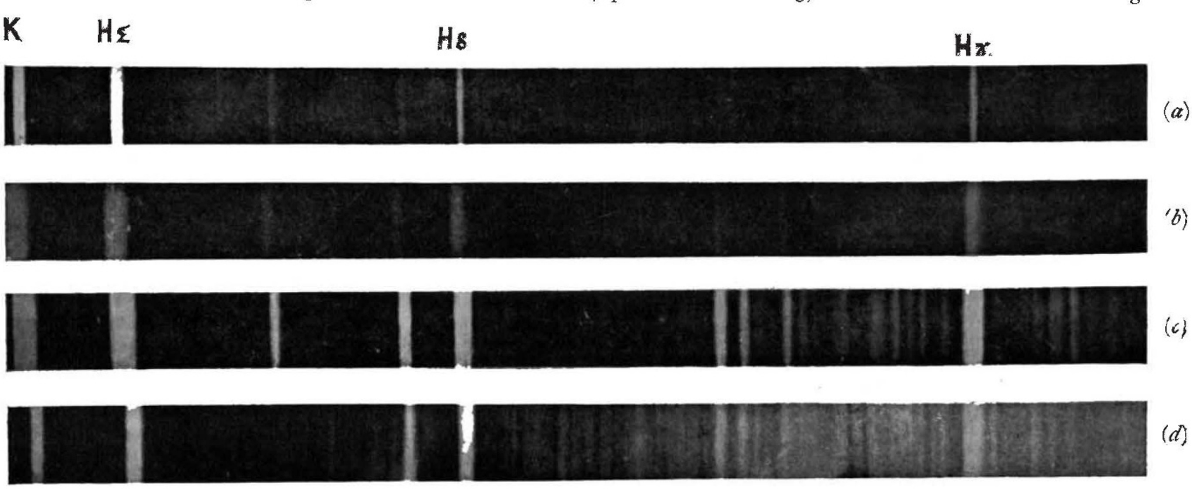


FIG. 25.—The spectra, *a*, *b*, *c*, of Prominence No. 3, photographed during the eclipse of 1893, compared with the spectrum of the base of chromosphere (*d*).
(*a*) 22″–26″ above photosphere.
(*b*) 7″–9″ ,, ,,
(*c*) 3″–4″ ,, ,,

minence No. 3 as it appears in the African Photographs Nos. 11, 9, and 7 respectively, the first giving the spectrum of the upper part only, while the last shows the spectrum nearer the base. Accepting the time of commencement of totality in Africa as 2h. 23m. 48s. by the deck watch, it has been calculated that Spectrum 1 represents a part of the prominence 22″–26″ (9950 to 11,600 miles) above the photosphere; Spectrum 2, 6″·7–8″·5 (3000 to 3800 miles); and Spectrum 3, 3″·7 (1660 miles) above the photosphere. Strip *d* is the spectrum of the base of the chromosphere as represented by the cusp in the African Photograph No. 22.

These enlarged spectra have been obtained by covering copies of the original negatives with tinfoil, leaving only narrow strips showing the prominence spectra, and giving them the necessary width by moving the photograph in a direction at right angles to the length of the spectrum.[1]

The want of exact coincidence of lines common to different horizons in the copies of the photographs which I have given is due to the difficulty of obtaining enlargements on exactly the same scale. The difference in thickness of the same line in different photographs of a prominence is due to the varying widths of the corresponding images of the prominence formed by the prismatic camera at different stages of the eclipse.

In order that the changes of intensity of the various lines may be separated from the effects due to varying exposures, the individual observations are arranged in groups according to the time of exposure of the photographs.

In contrasting the spectrum of the prominences with the spectrum of the cusp, it should be borne in mind that the cusp in the African photograph specially examined (No. 22), does not represent the base of the chromosphere immediately beneath either of the metallic prominences. Still the cusp was not far from a prominence (No. 19), and it is fair to consider the base of the chromosphere homogeneous. If so, the prominences cannot be fed from the base of the chromosphere, since they contain different vapours.

The Spectrum of the Chromosphere at Different Heights.

But we are not limited in these investigations to the study of the prominences; we can obtain similar information from the chromosphere itself.

The spectrum of the chromosphere itself at different heights can also be partially investigated in the eclipse photographs. A considerable arc of chromosphere was photographed in one of the African negatives (No. 21). The photograph was taken about ten seconds before the end of totality, so that the lower reaches of the solar atmosphere within 1660 miles of the photosphere were hidden. The bright arcs accordingly represent the spectrum of the chromosphere above that height. None of the photographs give us any information as to the spectrum lower down until we come to the part very near to the base which is shown at the cusp in another photograph (22). Most of the lines become relatively brighter as the base of the chromosphere is approached, but some become dimmer.

The Evidence as to the Existence of Layers in the 1893 Photographs.

The most direct evidence which the eclipse photographs give as to the separation of the solar atmospheric vapours into layers is that afforded by the increased relative brightness of some of the lines in passing to higher levels.

We have seen that a careful and impartial tabulation of intensities has shown that both in the prominences and in the chromosphere some vapours do seem to be brighter as they increase their distance from the photosphere.

[1] *Phil Trans.*, 1893, vol. clxxxiv. A. p. 684.

As we have to deal with the projection of a sphere and not with a section of the sun's atmosphere, the spectrum arcs would brighten in passing outwards from the photosphere in consequence of the increased thickness of vapour presented to us, even if the radiation per unit volume remained constant. The spectroscopic differences studied and carefully recorded show, however, numerous inversions even in the behaviour of the same line in different prominences, so that the increased brightness observed cannot always be due to this cause alone.

Some of the lines are brightest at the base of the chromosphere, while others are brighter at greater elevations. As already explained, some of the lines which are brightest above the photosphere are probably produced by vapours existing in layers concentric with, but above and detached from the photosphere. Those lines which become dimmer in passing outwards must owe their origin to vapours resting on the photosphere.

It will be obvious to everybody that the more the idea of the absorption which gives rise to the Fraunhofer lines taking place in one thin layer is disproved, the more certain it must be that it represents the integrated effect of several layers. Hence this special examination of the 1893 photographs, to which I am now directing attention, to see if there are any indications as to the localisation of the absorbing vapours which are not represented in the base of the chromosphere.

It will be noted that the evidence is distinctly in favour of such localisation *above* the chromosphere.

But the matter is so important that it must not be allowed to rest here, while photographs with higher dispersion are possible. Hence, then, the 1898 results must be carefully studied from this point of view.

The Chemical Constitution of the Sun's Atmosphere.

The results obtained with regard to the chemistry of the sun will, of course, depend upon the results of the accurate measurement of the arcs, both long and short, obtained in the prismatic cameras; and of the lines—true images of the slit—in slit spectroscopes; these measurements have for their object the determination of the wave-lengths of the radiations, so that they can be compared with the wave-lengths of terrestrial substances observed in the laboratory.

The dispersion employed in 1893 was only moderate as compared with that now used in laboratory work, though it was far greater than any employed in eclipse observations before. The doubled dispersion proposed for 1898 will necessitate additional precaution against error, and in return it may land us in new discoveries. To show that this remark is justified, I will first refer to the method employed in the determination of wave-lengths in the case of the photographs of the 1893 and 1896 eclipses.

The wave-lengths are expressed on Rowland's scale. In the region less refrangible than K, they have been determined from the African photographs, by comparison with the spectrum of Arcturus and other stars photographed with the same instrument, the wave-lengths of the lines in which were determined by reference to Rowland's photographic map. The spectrum of Arcturus is almost identical with that of the sun, so that the comparison lines were sufficiently numerous for the purpose. Stars like Bellatrix were employed as an additional check in the case of bright lines not coincident with prominent Fraunhofer lines.

Micrometric measurements of the lines were also made and reduced to wave-lengths in the usual way, by means of a curve; these furnished a check on the general accuracy. In the case of the Brazilian negatives wave-lengths were determined by means of micrometric measures and a curve, and checked by direct comparisons with a solar spectrum, photographed with the same spectroscope while it was temporarily provided with a slit and collimator. For the reduction of the ultra-violet, in both series of photographs the wave-lengths of the hydrogen lines have been assumed as far as $H\phi$ from those given by Hale,[1] with the exception of H_v, which falls sufficiently near the calculated wave-length to be accepted as a hydrogen line.

With these as datum lines, wave-length curves were constructed, and the wave-lengths of the other lines found by interpolation.

The wave-lengths of the radiations more refrangible than $H\zeta$ were determined from extrapolation curves, so that the degree of accuracy is necessarily less than in the case of the remaining lines.

The scale of intensities adopted is such that 10 represents the brightest lines and 1 the faintest. This facilitates comparisons with Young's well-known list of chromospheric lines, in which 100 represents the maximum frequency and brightness. The intensities have been estimated by taking the strongest line in each negative as 10, irrespective of length of exposure.

This much being premised, let us next consider the thing that is actually measured. If we study the actual photographs, or such reproductions as have been given in Figs. 17 and 18, it will be clear in a moment that the arcs are of different widths because some of the vapours and gases extend further above the photosphere, and therefore above the dark moon which covers it during an eclipse, than others. Obviously, then, we must not take the *centre of the arc*. It is also obvious that we must not take that edge further from the dark moon. If we did either of these things, the positions of the lines thus recorded would depend not only on the wave-length of the radiations of the vapours and gases which produced them, but also upon the thickness of the vapours.

If, however, we take the edge of the arc at the moon's edge, in every case we shall have a series of numbers involving wave-length only, *except under two conditions*, and this is a very important exception.

The first condition which may vitiate the determination of wave-length in this way is that some of the vapours or gases producing certain lines may be in movement sufficiently rapid along the line of sight to change the wave-lengths of the lines according to a well-known law. Suppose, for instance, we have a stream of iron vapour moving at the rate of fifty miles a second towards the eye through a mass of hydrogen at rest; the lines of the iron spectrum will be shifted towards the violet part of the spectrum, while those of hydrogen will be in their normal position. The higher the dispersion employed, the more carefully must such matters as this be studied. This cause, in fact, will in the case of very violent motion change even the forms of the prominences.

The forms of monochromatic images of the prominences being produced in part by the movement in the line of sight of the vapours which give rise to them, regions in which the vapours are approaching the earth will be displaced to the more refrangible side of their true positions with respect to the sun's limb, and in the case of receding vapours there would be displacements towards the less refrangible end. Such distortions can be determined, if they exist, by comparing the monochromatic images with those photographed at the same time with the coronagraph. For this purpose, in dealing with the eclipse of 1893 a photograph of the eclipsed sun was enlarged to exactly the same size as the K ring shown in Fig. 9, and the comparison could be made very exactly by fitting a negative of one to a positive of the other. No differences of form, however, could be detected, so that the velocities in the line of sight must have been comparatively small. Movements across the line of sight will not affect the forms of the monochromatic images of the prominences.

[1] "Astronomy and Astrophysics," 1892, pp. 50, 602, 618.

This is a true physical origin of the change of wave-length which may be detected in eclipse photographs; but there is a second, as I have hinted. This, although only an apparent change, has to be reckoned with, since, on the one hand, it may be very misleading, while, on the other, if properly dealt with, it may furnish us with new knowledge.

I have already pointed out that in the determination of the wave-length of the arcs in the prismatic camera photographs the edge of the line nearest to the dark moon must be measured, rather than the other edge or the middle of the arc. But this assumes that all the arcs really rest on the dark moon. *It is possible, however, that some of them do not extend down to it—that they represent real upper layers*, and in this case the wave-length obtained by a reference to the dark moon will not be the true one, and, by some means or another, it will have to be corrected. This, though a difficult problem, does not seem an impossible one.

Eclipse Work in relation to the Dissociation Hypothesis.

In the course of the spectroscopic solar investigations which have been going on since 1868, I have pointed out over and over again that the phenomena observed could be more easily explained on the hypothesis that the chemical elements with which we are familiar here were broken up by the great heat of the sun into simpler forms, than in the ordinary one that the "elements" as we deal with them in laboratories are incapable of simplification, that is that they are indestructible.

The recent work on the enhanced lines of several of the metallic elements, really enables us to predict what we shall obtain in the Indian eclipse if the dissociation hypothesis be true.

With regard especially to the bearing of the 1893 work on this view, I may state that it is entirely in its favour. The preliminary discussion of individual substances has further abundantly shown that although some of the lines belonging to any particular metal may appear as dark lines in the solar spectrum on account of absorption by the chromosphere, other lines of the same substance are only represented among the dark lines because of absorption taking place elsewhere. This again is an indication of the stratification of the sun's absorbing atmosphere, which, if it exists, must furnish a very strong argument in favour of the dissociation of metallic vapours at solar temperatures. In fact, the eclipse phenomena have been found to be as bizarre, in relation to the non-dissociation hypothesis, as those which I have already discussed in relation to observations of sun-spots, chromosphere, and prominences, made on the uneclipsed sun.

The long-continued Italian observations of the quiet solar atmosphere and the Kensington observations of sun-spots have already been especially mentioned. Not only is there no correspondence in intensity, but the variation in the sun-spot spectrum from maximum to minimum is enormous, while the Fraunhofer lines remain constant.

The view I expressed in 1879,[1] and to which I adhere, is therefore strengthened by the eclipse work. I then wrote: "The discrepancy which I pointed out, six years ago, between the solar and terrestrial spectra of calcium is not an exceptional, but truly a typical, case. Variations of the same kind stare us in the face when the minute anatomy of the spectrum of almost every one of the so-called elements is studied. If, therefore, the arguments for the existence of our terrestrial elements in extra-terrestrial bodies, including the sun, is to depend upon the perfect matching of the wave-lengths and intensities of the metallic and Fraunhofer lines, then we are driven to the conclusion that the elements with which we are acquainted here do not exist in the sun."

[1] *Roy. Soc. Proc.*, 1879, vol. xxviii. p. 13.

Conclusion.

In the course of this series of articles, I have referred to the many points on which light was thrown by the observations made in 1893.

It is quite obvious that the aim of those who observe in India next year with the view of advancing the more important problems of physics and chemistry presented to us by the eclipsed sun, should work along the new lines with a view of testing the soundness of the conclusions so far arrived at, and of obtaining new knowledge. I cannot, I think, more fitly close this article than by giving a very brief summary of the conclusions arrived at in the observations of 1893, so that my readers can gather the drift of much of the work that will be undertaken in 1898.

(1) With the prismatic camera photographs may be obtained with short exposures, so that the phenomena can be recorded at short intervals during the eclipse.

(2) The most intense images of the prominences are produced by the H and K radiations of calcium. Those depicted by the rays of hydrogen and helium are less intense and do not reach to so great a height.

(3) The forms of the prominences photographed in monochromatic light (H and K) during the eclipse of 1893, do not differ sensibly from those photographed at the same time with the coronagraph.

(4) The undoubted spectrum of the corona, in 1893, consisted of seven rings besides that due to 1474 K.

The evidence that these belong to the corona is absolutely conclusive. It is probable that they are only represented by feeble lines in the Fraunhofer spectrum, if present at all.

(5) All the coronal rings recorded were most intense in the brightest coronal regions near the sun's equator as depicted by the coronagraph.

(6) The strongest coronal line, 1474 K, is not represented in the spectrum of the chromosphere and prominences, while H and K do not appear in the spectrum of the corona, although they are the most intense radiations in the prominences.

(7) A comparison of the results with those obtained in previous eclipses confirms the idea that 1474 K is brighter at the maximum than at the minimum sun-spot period.

(8) Hydrogen rings were not photographed in the coronal spectrum of 1893.

(9) D_3 was absent from the coronal spectrum of 1893, and reasons are given which suggest that its recorded appearance in 1882 was simply a photographic effect due to the unequal sensitiveness of the isochromatic plate employed.

(10) There is distinct evidence of periodic changes of the continuous spectrum of the corona.

(11) Many lines hitherto unrecorded in the chromosphere and prominences were photographed by the prismatic cameras.

(12) The preliminary investigation of the chemical origins of the chromosphere and prominence lines enables us to state generally that the chief lines are due to calcium, hydrogen, helium, strontium, iron, magnesium, manganese, barium, chromium, and aluminium. None of the lines appears to be due to nickel, cobalt, cadmium, tin, zinc, silicon, or carbon.

(13) The spectra of the chromosphere and prominences become more complex as the photosphere is approached.

(14) In passing from the chromosphere to the prominences some lines become relatively brighter, but others dimmer. The same lines sometimes behave differently in this respect in different prominences.

(15) The prominences must be fed from the outer parts of the solar atmosphere, since their spectra show lines which are absent from the spectrum of the chromosphere.

(16) The absence of the Fraunhofer lines from the integrated spectra of the solar surroundings and uneclipsed photosphere shortly after totality need not necessarily imply the existence of a reversing layer.

(17) The spectrum of the base of the sun's atmosphere, as recorded by the prismatic camera, contains only a small number of lines as compared with the Fraunhofer spectrum. Some of the strongest bright lines in the spectrum of the chromosphere are not represented by dark lines in the Fraunhofer spectrum, and some of the most intense Fraunhofer lines were not seen bright in the spectrum of the chromosphere. The so-called "reversing layer" is, therefore, incompetent to produce the Fraunhofer spectrum by its absorption.

(18) Some of the Fraunhofer lines are produced by absorption taking place in the chromosphere, while others are produced by absorption at higher levels.

(19) The eclipse work strengthens the view that chemical substances are dissociated at solar temperatures.

NORMAN LOCKYER.

VICTOR MEYER.

VICTOR MEYER was born on September 8, 1848, and died on August 8, 1897. He studied chemistry at Heidelberg, under Bunsen, and at Berlin, under Baeyer. His first official appointment was at Stuttgart, whence he was called, in 1872, to the chair of Chemistry at the Zürich Polytechnic. In 1885 he went to Göttingen, and in 1889, on the retirement of Bunsen, he was appointed Professor of Chemistry at Heidelberg. The later years of his life were clouded by ill-health. His almost abnormal mental activity allowed him no rest, and he suffered greatly from insomnia. To the effects of this malady on a highly sensitive nervous organisation must be ascribed his tragic death in the midst of a career which, brilliant though it was, gave promise of still greater things in the future.

As an investigator Victor Meyer undoubtedly stands in the very front rank. In these days of specialisation it is given to but few men to possess a complete mastery over more than one department of a science. Meyer was equally at home when dealing with the problems of physical chemistry and when working out the chemistry of a group of organic compounds.

His first important investigation was that on the nitro-paraffins. In 1872 he discovered nitro-ethane, and, following this up with characteristic energy, had soon studied several of its homologues, as well as secondary and tertiary nitro-paraffins. By the action of nitrous acid on these substances he obtained nitrolic acids and pseudo-nitrols, and, by his study of these substances, cleared up the constitution of iso-nitroso and nitroso compounds. In 1882 he made the important discovery that iso-nitroso compounds are formed by the action of hydroxylamine on aldehydes and ketones. The generality of this reaction has been of considerable importance in the determination of the constitution of organic compounds, affording a sure indication of the presence of a carbonyl group.

Meyer's discovery of the oximes may be regarded as the foundation of our knowledge of the stereochemistry of nitrogen, for in 1888, working with his pupil Auwers, he showed that the two isomeric benzil dioximes then known were structurally identical. It is of interest that the molecular weights of these bodies were shown to be identical by means of the, then little known, cryoscopic method. To the further development of the stereochemistry of nitrogen, Meyer and his pupils contributed not a little.

The discovery of thiophene in 1882 by Victor Meyer was the result of a lecture experiment which failed. Benzene prepared from benzoic acid was shaken with strong sulphuric acid and isatin, and failed to give the