

Ordinary Meeting, 26th November 1918.

The minutes of the proceedings of an ordinary monthly meeting of the members of the Society held on Tuesday, the 26th November 1918, at the Imperial Secretariat (Treasury) Buildings. The President, Dr. T. Royds, D.Sc., F.R.A.S., etc., was in the Chair.

The minutes of the annual general meeting of the Society held on the 29th October 1918 were read and confirmed.

The presents received since the date of the last meeting were read and confirmed and a vote of thanks was accorded to the donors.

The President made an announcement regarding the use of the members of the Society's telescope and said that a notice on the lines of this announcement would be published in the Monthly Notices of the Society.

Mr. P. C. Bose, Scientific Secretary of the Society, next read a short history of the Nova Aquilæ.

Mr. Weston read and explained a paper by Mr. Thos. Deighton, B.Sc., on another illustration of Einstein's theory, also a paper by the Rev. A. C. Ridsdale, M.A., F.R.A.S.

A Short History of Nova Aquilæ.

By P. C. BOSE.

I

The position of the constellation Aquila is unique, situated as it is between R.A. 18h. and R.A. 20h. 30m. and Decl. 15° N and 12°-30' S of the Celestial Sphere. Among a host of comparatively less conspicuous stars Altair commands the attention of the inhabitants of the Globe whether they be situated N or S or E or W. Actually what happened nobody can say with certainty, but so far as we have been able to ascertain, on the night of the 8th June, a new star flared out in the constellation Aquila, and it was seen from all parts of the Globe.

In India it was seen by—

- 1st—Mr. G. N. Bower, Madras.
- 2nd—Mr. C. L. Dundas, Jhelum.
- 3rd—Mr. Damodar Pramanik, Head Master, Raniganj
H. E. School.
- 4th—Mr. P. M. Robertson, Rajmahal.
- 5th—Mr. Radhagobinda Kar, Jessore.
- 6th—Mrs. M. R. Murray, Central Provinces.*

In England it was seen by—

- 1st—Miss Grace Cook, Stowmarket.
- 2nd—Mr. W. F. Denning, Bristol.
- 3rd—Mr. David Pocker, Birmingham.
- 4th—Mr. C. L. Brook, Meltham.
- 5th—Mr. W. H. Stevenson, West Norwood.
- 6th—Mr. H. Thomson, New Castle.
- 7th—Mr. Felix de Ray, Thornton Heath.

It can be said without fear of contradiction that the credit of the priority of the discovery falls to the lot of Mr. Bower of Madras. The story of the discovery is very interesting. On the night of 8th June at 10 P.M., Indian standard time, Mr. Bower was pointing out principal stars to a friend with the help of Mr. Evershed's Star Chart when he happened to come to a bright star in Aquila which was not found in the Chart. He at once suspected it to be a nova and telegraphed as such to the Kodaikanal Observatory.

Miss Grace Cook saw it at 9-30 P.M., G. M. T. 10 P.M., Indian standard time, is equal to 4-30 P.M. Greenwich mean time. So we see that Mr. Bower saw the star 5 hours before Miss Cook. Mr. Dundas, who has sent us his notes, saw the nova at 4 P.M. on the morning of Sunday, 9th June (about 10-30 P.M., G. M. T, 8th June), an hour after Miss Cook. He also sent a telegram to Kodaikanal at 8 A.M. on the same morning.

Mr. Robertson saw it on the night of the 9th when in camp at Rajmahal.

Mr. Pramanick, it is said, saw it on the night of June 8th, and sent a note to the *Bengalee*, a daily paper, but for reasons unknown the note was not printed in that

* Mrs. Murray has since written to say that the observation was made by her late husband, whose observation she verified.

paper till after the announcement of the discovery by Reuter.

Mr. Radhagobinda Kar saw it on the same date, but was doubtful whether to call it a nova owing to the clouds which hindered his observation.

Mrs. Murray, a very energetic member of the Astronomical Society, saw it on the 9th and conveyed the tidings to the Society by a letter on the 10th, which reached the Society after the 12th, when the news of the nova was fully announced by the papers.

Strange to say, that though so many people saw the nova at or about the same time, and communicated the discovery to the Calcutta papers and to Kodaikanal Observatory, yet none dared publish it before Reuter's telegrams which was, just at this time, delayed by about three days and received in India on the 12th. Perhaps they feared a hoax. From facts that are to hand it can be inferred that the star made its appearance on the 8th June, as a 1st magnitude star and was equal to Altair. We shall discuss the variations later on.

The position of the nova was determined at Greenwich Observatory and Nizamiah Observatory at Hyderabad with great accuracy. The Greenwich Transit Circle gives it as R.A. 18h. 44m. 43.47s. Decl. $0^{\circ}-29'-31.5''$ for 1918-0 with the 28" refractor Greenwich the R.A. is 18h. 44m. 43.48s. and Decl. $0^{\circ}-29'-28.2''$. From a photograph taken at Hyderabad the position was found to be R.A. 18h. 44m. 43.43s. and Decl. $0^{\circ}-29'-29.5''$. Now comes something very interesting. In the Algiers's Photographic Catalogue and Chart there is a star of 8.8 magnitude in the position R.A. 18h. 44m. 43.52s. and Decl. $0^{\circ}-29'-31.0''$ for 1918.0. It was photographed at Algiers on the 26th June 1895 and 20th August 1909. The same star has been found on other photographs and doubtless will be found on numerous photographs at Haward. M. Comas Sola at Barcelona also announces that he has photographs taken in 1915, 1916 and 1917, which show a star very close to the position of the nova, he gives the photographic magnitudes as follows :—

1915 July —10.2.
 1916 May —10.2.
 1917 June —11.0.

It seems highly probable that this star is identical with the nova.

II.

Let us next turn our attention to the study of the spectrum of the nova. Mr. Dundas was the first to send us his observation of the spectrum of the nova, and we consider it convenient to publish his note *in extenso*. "The spectrum as seen through a Zollner Star Spectroscope appeared to have lines like those in Solar Spectrum, but the β and γ lines of hydrogen showed up bright in the background. There were also traces of bright flutings not so pronounced in the blue, green and yellow. Dark lines on the more refrangible sides of the bright lines may have been present but were not conspicuous. The conspicuous feature was a spectrum showing only fine lines of absorption—but $H\alpha$ and $H\beta$ in the blue and violet standing out bright.* I did not see the star on the 11th, but on the evening of the 12th, the star, if I remember rightly, had passed its maximum brightness. The spectrum, however, had developed to a remarkable extent. The crimson $H\alpha$ or C line shone out bright and brilliant. $H\beta$ and $H\gamma$ also stood out far brighter, whilst other bright lines also appeared one in the violet between $H\beta$ and $H\gamma$ and others in the green. The yellow was not a conspicuous feature of the spectrum, the green nearly ran into the red. At the same time dark absorption flutings sharp towards the violet end had appeared and the fine line spectrum was blotted out by these dark flutings. β Dark lines next the bright ones were not very noticeable if at all, except possibly next the crimson bright line ($H\alpha$ or C), but this may have been an effect of contrast. The conspicuous feature as compared with the 10th was the blaze of the bright line spectrum especially $H\alpha$.

By Friday, the 14th, the star had decidedly faded being about the brightness of the Altair, and the subsequent fading was very rapid. On the 14th, the bright line spectrum was far less bright. $H\alpha$ or C being inconspicuous instead of blazing as it had done two nights previously and the dark fluting on its refrangible side was even more noticeable." This as an example of eye observation is superb. Now we shall see what Mr. Evershed has to say about it. He used a six-inch prismatic camera and a two-inch prismatic camera, showing considerable extension in the ultra-violet. He was able to photograph the spectrum of the nova and Arcturus

* Probably $H\beta$ and $H\gamma$ or $H\gamma$ and $H\delta$ are meant as H_2 and H_3 are lines in red and bluish green.

to the same scale for convenience of comparison, as Arcturus gives the same kind of spectrum as the Sun. On the night of June 12-13 and 13-14 there were two sets of hydrogen absorption lines both enormously displaced toward violet, the wider and more refrangible series in $H\beta$ $H\gamma$ and $H\delta$ gave a mean displacement of 2700 km. per sec., whilst the comparatively less refrangible series gave 1720 km., per sec. both in the direction of approach. In later plates June 19-20, the more refrangible side of lines had vanished, whilst the less refrangible set showed a slight increase of velocity which was estimated at 1860 km. per sec. Mr. Evershed found a similarity of this accelerating motion to the eruption prominences of the Sun. The hydrogen emission bands α and β were very intense, but beyond $H\alpha$ in the ultra-violet they become undistinguishable. But the reverse is the case with the absorption lines which were the strongest there and have been photographed up to $H\tau$ on June 18-19. The $H\alpha$ line stood out isolated and without absorption in all the plates except the one taken on June 13-14.

The star has been computed, it is stated, to be at a distance of ten thousand billions of miles from our system; so that the catastrophe or flare, call it what you like, must have occurred more than 1700 years ago or between the 2nd and 3rd Century A.D.

Parallels to the Nova Aquilæ are very rare among the multitude of novæ that have been discovered up to the present. Only two can be named that showed some similarity to this star. One is T Coronæ discovered in 1866 and the other is Nova Cygni discovered in 1876. From an insignificant star T Coronæ (in Corona Borealis) suddenly blazed out and in 3 or 4 hours from the 4th mag.—rose to the 2nd mag. It showed the same kind of spectrum as the Nova Aquilæ did and contained both the dark line and bright hydrogen bands. The star began to fade away and after a slight vibration remained fixed at about the 8th mag.

Nova Cygni also showed the same kind of spectrum as T Coronæ at the beginning, but when examined a year later it showed only one line, the continuous spectrum and all the other lines having disappeared. This nova did not rise above the 3rd mag.

The variations of the nova have been studied by Mrs. Murray and myself. It will be well to mention here that owing to clouds continuous accurate observations were impossible. The graphic representation will be published in the next issue of the Journal,