stored in the amorphous cement around the crystals as conceived by Rosenhain, because (1) all the available evidence is against the view that the crystals of castings grow; (2) the greater the surface area of a crystal the more energy it should possess, and on this view a large crystal should absorb a small one. It has been shown that this is by no means always the case. It is considered that until much fuller knowledge of the structure and properties of crystals has been obtained, the true explanation of the effects of work upon metals will not be forthcoming.

The New Star in Cygnus.

By MAJOR W. J. S. LOCKYER.

THE new star in Cygnus, the third discovered in that constellation, and therefore designated Nova Cygni III., was of magnitude 3·5 when first observed by Mr. Denning on August 20, but is now very faint, being below 9th magnitude. It is still visible in small telescopes, but requires large instruments for spectroscopic investigation.

A summary of the earlier part of the star's history—*i.e.* previous to August 20—is brought together by Mr. Felix de Ray in the current issue of the *Observatory* (vol. xliii., No. 557, October), and is of great interest. Thus the object was not visible on June 3, 1905, when a plate taken of that region showed stars down to the 16th magnitude. On July 20 of the present year another plate taken there recorded stars down to magnitude 11; but still there was no trace of the nova. A photograph taken at Harvard on August 9, 1920, shows stars to the 9th magnitude, and no nova appears upon it; but the object was recorded there on August 19, and its magnitude was then 4·8. An earlier record than this is given on a plate taken by Nils Tamm in Sweden on August 16 of this year, when it was shown as a 7th-magnitude star.

The above records give an idea of the nature of the rise in magnitude of the nova, and these data (broken lines), combined with the excellent series of observations made at Greenwich (continuous lines), and published in the same number of the *Observatory* (p. 367), enable the light curve of the nova to be constructed. This curve is given in Fig. 1. It will be seen that, like all novæ, there is a very rapid rise to maximum brilliancy, followed for a short period by an almost as rapid decrease. After that the decrease is more gradual, but at a quicker rate than is generally the case in later stages of novæ.

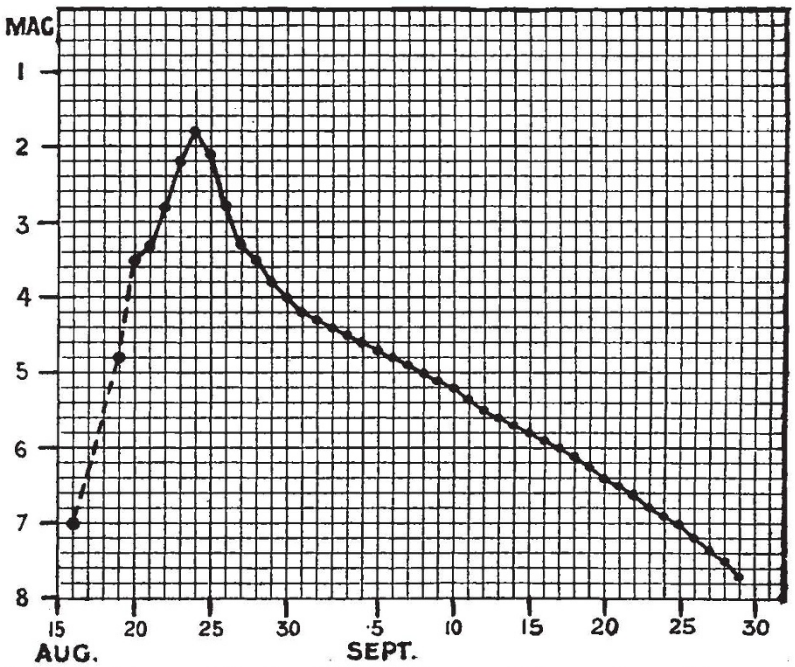


FIG. 1.—The light curve of Nova Cygni III., illustrating the rapid rise to maximum and the comparatively slow descent. The unbroken line is from observations made at Greenwich Observatory.

It should be remarked that the Greenwich values here recorded are "smoothed" values—that is, a mean curve has been drawn through the original observed values. This process has the drawback of eliminating any small oscillations of magnitude which may occur in the original curve. Thus on the descending side of the curve there are undoubtedly instances where the nova not merely retained the same magnitude for two consecutive nights, but actually increased in brightness. Such fluctuations were, however, on a very small scale, and nothing like the pronounced regular variations which Nova Persei presented after it had reached the 4th magnitude, the amplitude of this fluctuation amounting to about one and a half magnitudes in periods of three or four days.

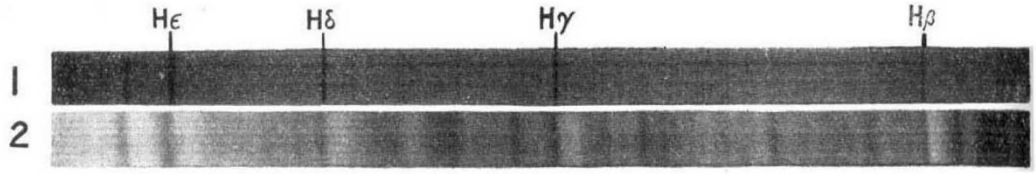
No less interesting has been the spectroscopic study of this nova. Up to the present time very little has been published on the subject, but no doubt several communications upon it will be made at the November meeting of the Royal Astronomical Society. In Section A of the British Association at the recent meeting Prof. Fowler showed some slides taken from negatives secured at the Hill Observatory, Sidmouth, on the night of August 22, when the nova was approaching its maximum.

These photographs showed that the spectrum was practically identical with that of the star α Cygni—that is, it was practically an absorption spectrum. This star is noted for exhibiting fine, sharp lines representing metals at a very high temperature, these lines being enhanced when passing from the temperature of the arc to that of the spark. Two nights afterwards, when the nova attained its maximum brilliancy, all the lines became broad and fuzzy, and bright components to the lines began to show up at the red end of the spectrum. More recent work at the Hill Observatory has shown that at later stages all lines became more diffuse, a larger number of bright components appeared, and the continuous spectrum began to dim.

The stage when the nova showed a *typical* nova spectrum is illustrated in Fig. 2. It will be noticed that amongst others all the dark hydrogen lines have bright components on the right-hand side. For the sake of comparison, a spectrum of the star α Cygni is placed above the nova spectrum, and the line Hβ is made to fit the dark Hβ in the nova.

The reason why the other hydrogen lines in α Cygni do not fit those in the nova is that, owing to the great velocity in the nova, these lines are displaced towards the left—*i.e.* towards the violet. From measurements made, the velocity in the line of sight works out at about 400 to 900 km. per sec., depending on the date on which the photograph was taken. In this particular case—namely, August 26—the velocity was about 900 km. per sec., and was actually the maximum velocity attained.

At a late stage in their career novæ begin to exhibit the nebular lines. The first indication of this stage having been reached in the present nova was recorded on a photograph taken at the Hill Observatory, Sidmouth, on October 22. The stage might have been reached at possibly an earlier date, but no records were available between October 2 and the date mentioned above.



1. α Cygni. 2. Nova Cygni, August 26.

FIG. 2.—The spectrum of Nova Cygni on August 26, showing the *typical* nova spectrum. The comparison spectrum is that of α Cygni, which the nova closely resembled on August 22.

As a rule, new stars are far more scarce than comets, but Mr. Felix de Ray points out the interesting fact that for a couple of years novæ have been more plentiful than comets, and that at the present time no fewer than four novæ, including Nova Aquilæ III., Nova Lyræ, and Nova Ophiuchi IV., can be observed with small apertures.

Obituary.

DR. HERMANN STRUVE.

DR. KARL HERMANN STRUVE, who died on August 12 at the age of sixty-six, belonged to a family famous in astronomy, being the son of Otto Struve, and the grandson of F. G. W. Struve. All three were gold medallists of the Royal Astronomical Society, this being a unique case of hereditary distinction in the annals of that body.

K. H. Struve was born at Pulkova in 1854, being the third of the four sons of Otto Struve, who was then director of Pulkova Observatory. He studied at Dorpat University, where he showed special aptitude in physics and optics. Apparently it was the acquisition of the 30-in. refractor at Pulkova that tempted him to devote his life to astronomy. It was with this instrument that he made the splendid series of observations of Saturn's satellites for which his name will be chiefly remembered. He adopted the plan of comparing the satellites with each other, instead of with Saturn, which led to a great increase in accuracy. His discussion of the observations gave greatly improved values of the masses of primary, ring, and satellites, and of the positions of Saturn's equator and the orbit planes; it also revealed some interesting librations in longitude. For this work Struve was awarded the R.A.S. medal and the Damoiseau prize of the Paris Academy. A similar investigation on the system of Mars gave the position of Mars's equator, the amount of its oblateness, and the rate of motion of the nodes.

Other astronomical work included double-star measures, star parallaxes, micrometer measures of Eros, and drawings of Jupiter; moreover, in 1874 Struve took part in the Russian expedition to Port Possiet, Eastern Asia, to observe the transit of Venus.

In 1895 Struve became professor of astronomy at Königsberg, and director of the observatory, for which he obtained a 32·5-cm. refractor. In 1904 he succeeded Dr. W. Foerster as director of the Berlin-Babelsberg Observatory, retaining this post until his death. So late as 1916 he made further observations on Saturn's satellites with