the Astronomical Society has been unavoidable The indulgence of Members is craved all the same. The editorial work must entail, besides other details, a constant attention to the entire get-up of the Magazine and with other pressing business in the hands of the management, delay has had to be met in the issue of the Magazine. The new management of the Society, however, have put things on a better footing since; and care will be taken in future for the issue of the Magazine in rigt time.

Explanation of the Phenomena of a Nova

By W. H. Pickering

Abstract by—Rai U. L. Bannerjea Bahadur.

Mr. W. H. Pickering in his paper dated 15th August 1918, suggests an explanation of the phenomena presented by a Nova. He first discusses the explanation formerly given that the appearance was due to the collision of two stars, and put forward two objections to this suggestions. First stars being too small in proportion to the distances between them cannot permit frequent collisions so as to cause the appearance of novæ every 3 or 4 years and in the second place the mass of the two stars is so large that it would require centuries for a nova to cool down, instead of weeks, by which the novæ ordinarily cool down. Some hold that the stars need not necessarily collide but may pass near enough to produce violent tides, leaving open the surface and exposing the hot interior, but Mr. Pickering thought that no tidal effect could produce a phenomena in which light of a nova can increase 10,000 folds in so short space of time as 6 days, as was the case with the recent nova in Aquila.

The next suggestion is that the phenomenon was due to an encounter of a star with a meteor shower or a comet. But Mr. Pickering is of opinion that the masses of all known comets are infinitesimal and would be wholly inadequate to produce the effects observed in the recent nova.

He next goes on to the last and at present the most popular theory that the outburst is due to a collison between a star and a nebula. This would avoid the first difficulty if the nebula is large enough, but not the second. The recent nova was not more than 6 days in reaching its maximum brilliancy, immediately after which it rapidly decreased in light. If the star were travelling through the nebula at the rate of speed of the earth in its orbit, which is a fair rate for an average stars, in 6 days it would have travelled 9,000,000 miles If spherical, this would be a very small nebula indeed and an object that it would be very unlikely that a star would hit, This difficulty might he avoided if we assume the nebula to be spread out into a wide flat sheet having only that thickness. Novœ never last very long, so that this theory would imply that most nebula are flat and thin and are always crossed transversely both of which propositions seem improbable."

But there are still more serious objections to the thory. It was originally suggested to explain the usual nova spectrum, that of bright lines accompaned on their blue sides by heavy dark ones. The bright lines were supposed to be due to the nebula and the dark ones to the star. The spectra of a very considerable number of novœ are now known, and in all cases the dark band is on the blue side. Therefore in every one or other cases the nebula must be receding and the star approaching. Moreover the velocities, are extraordinarily high, several hundred miles a second, so that the direction of the collision must be always nearly in the line of light. These facts seem improbable.

Still another difficulty is that the Nova in at least two other cases besides the one had reached to maximum brilliancy

before the bright lines appeared, or in other words before the star reached the nebula.

Mr. Pickering then proceeds to show what other kinds of bodies might produce the nova phenomenon by collison. In making this suggestion he gives up the usual plan adopted by different authors to try all the types of known heavenly bodies and see which one might reproduce the nova phenomenon by colliding with the sun. He starts with the observed facts and tries to find out what kind of a body could produce the above phenomenon Taking the facts that in the case of the recent nova it was of the eleventh magnitude on the 3rd June, and 4 days later assumed a brightness increased 100 times and a day later 160 times and the following 6 times more; and observing that at its maximum brilliancy, it was 10,000 times as bright as 6 days ago, Mr. Pickering goes to investigate whether a planetoid whose mass is $\frac{1}{1000}$ part of that of the earth, which precipitated upon the sun from a great distance with a velocity of nearly 400 miles persecond. If the heat produced more uniformly distributed in time, it would be equal to the heat of the sun for 300 days. If the output is not uniform and that at the maximum the heat was given out so fast that at a uniform rate it would last only 6 days, the heat's emission would only be 50 times as great as at the present time.

The enormous increase of brightness of the nova combined with the fact that at its maximum its spectrum was only as blue as type A, leads us to believe that it was originally a rather non-luminious red or yellow star. Taking the surface temperature of type A star as 11,000°, if a planetoid were to strike a red or yellow star, converting it temporarily into a star of type A, its surface temperature would be increased to 2.2 times and the sun would then give out 23 times its normal output of heat and it would be shinning with 9 times its normal light.

It is known that when a shell fired from a cannon strikes the sea at a small angle, it causes an enormous vertical splash. In the cave of nova there should not only be a splash, but a tremendous explosion owing to the heat generated converting

this solid matter of the planetoid into gas, and expanding gases in the interior of the star and scattering the photosphere in all directions. The increase in the size of the nova and the increase of its brilliancy suggests such a collison and consequent explosion.

Mr. Pickering then goes onto examine the spectrum of the nova and shows that as the brightness of the recent nova was on the 10th June 1.5 magnitude fainter than on the previous day, it implied that the photosphere masses fell back towards the star, thus becoming hotter. The spectrum indicated that the erruption prominences of hydrogen and helium first passed through the photosphere on that date.

The usual spectrum of the nova, after the explosion has taken place, consists of bright and dark lines, the brightness being displaced toward the red end of the spectrum. These indicate that the flames of hydrogen and other gases are receding from the earth, while the dark lines indicate similar flames approaching us. The reason why the approaching flames appear dark and the receding ones bright is readily understood if we assume that both are hottest and therefore the brightest when they leave the star. As they recede they cool, and then approaching us are preceded consequently by a cool comparatively dark cloud of gas giving rise to dark lines. These receding from us on the other-hand have the dark cloud on the farther side of them and therefore appear bright. The cloud approaching us cannot absorb the light of the bright rays from the recent flames because they are of different wave length. The fact that vast quantities of gas are really emitted is clearly indicated by the observations that in several cases the later spectrum of the Nova has become that of a nebula. These cool gas clouds gradually conceal the nova which only reappears when they have condensed upon it or dissipated.

Mr. Pickering then discusses whether there be any evidence besides that of Nova that such planetiods really exsist. There is certainly no direct visual evidence, for even if such a body seen now actually approaching our sun and were ahead will within the orbit of the Saturn and about to reach us within

2 or 3 years, it is very doubtful, if we should be aware of its presence.

It is not necessary however to suppose that planetoids are uniformly distributed throughout space as that they all are of equal size and mass. Indeed judging by the distribution of the observed Novœ and the Wolf-Rayet Stars, which are associated with them, we may conclude that the Planetoids are confined largely to regions very remote from us in the vicinity of the Galactic Equator. It is quite possible too that they may frequently travel in clusters like stars or like meteors. A cluster composed of a few thousand such bodies even if they are separated by many millions of miles would be a very dangerous object for a star to encounter and yet at the same time would be of insufficient mass and brightness.

THE MAN MANDIR OF BENARES.

By Mr. P. C. Bose.

The old Hindu Philosophers classified knowledge into two stages—(1) *Bignan i. e.* knowledge of special subjects which comes under the meaning of Natural Philosophy and (2) *Poragnan* or *Brahmagnan i. e.* the knowledge of the Supreme Being. They used to aver that those that dabbled in *Bignan* can scarcely attain the stage of *Poragnan* because the earthly charms which surround it blind their visions from the deeper and permanent bliss which is the outcome of the later. just like a brimble-bee that remains enraptured with the painted lotus.

Those beings that could rise above the *Bignan* stage and attain the *Paragnan* were called *Devas* or *Suras* and those that could not were called *Apadevas* or *Asuras*. These *Asuras* in later mythologies were divided into four classes *viz. Yakhas*, *Rakhasas*, *Gandharvas*, *Kinnaras* according to their various callings. These beings were something higher than human beings and not so bad as some of the mythologies paint than to be. We shall for the present leave the other