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EDITORIAL

THE COMING OPPOSITION OF THE PLANET MARS

When the planet Mars enters into opposition on the 24th June of the present year, it is to be expected that many telescopes, both large and small, will be turned towards the red planet in an endeavour to observe as much as possible of its interesting topography. There can be no doubt about the fact that those members of the society who are in the happy possession of a telescope will be amongst the many who will watch enthralled the majestic unfolding of each new day on some typical region, and observe the daily pageant of events on our distant neighbour, as the surface marks are turned through the mists of early morning into the full glare of the noontide sun, and back again through the afternoon into the sunset and on into the bitter cold of night.

Focussing a small telescope on the planet, and putting one's eye to the eyepiece, the first impression gained is of a circle of deep blue profundity, from out of which shines a tiny spot of reddish-hued light. At first glance, perhaps, only the brilliant spots at either end of the disc are seen—these being the polar caps. Another fact that may be ascertained upon inspection is that of the brighter aspect of the edge or limb. As the eye becomes accustomed to this new ordeal so this tiny spot of light reveals more of itself. The disc is seen to be stripped by dusky shades of varying intensity, whilst here and there a somewhat brighter spot may be seen, apparently obscuring some region familiar to areographers. If opportunity is taken of steady moments in our own atmosphere, more of the fainter details may be perceived, and to those equipped with larger instruments, the chance may come of a fleeting glimpse of one of the prominent canali, for which the planet is so well famed. Whilst, in addition, if a prolonged watch is kept the steady eastward advance of the marks across the disc, the effect of Mars' rotation will become evident, presenting him with an ever-changing aspect.

The features that may reasonably be observed with apertures of from 2 to 3 inches aperture include: Syrtis Major, a mighty triangular object with its base facing southwards; this feature is by far the most prominent on the martian surface, it being traced on some of the first telescopic drawings ever made by terrestrial astronomers. Another interesting region easily seen in a small glass is that named the Mare Acidalium, which lies in the northern hemisphere of the planet, almost connected to the north polar belt area. Other features may vaguely be seen but the two mentioned above may be seen and observed easily and without trouble, i.e., if they are not obscured by martian cloud. This latter phenomenon may provide observers with an interesting task in the working out of a cloud-drift chart from the observations. In this connection, the melting of the northern polar cap will present an interesting sequence of events always a source of excitement to planetary observers. Thus it is readily seen that all in all a small instrument will reveal some of the features of fiery Mars, and in addition show some of the major transformations that occur during the martian year, over the surface of the planet.

A typical view of Mars as seen in a 6.5in. reflecting telescope may be seen in this journal. Several canals and clouds are shown, as also the north polar cap, which at the time the drawing was made, was undergoing seasonal melting. On the drawing, north is at the bottom and east on the left-hand side, as is the usual telescopic view. The markings appear to move across the disc from right to left, again as in the telescopic view.

THE EDITOR.

A LETTER FROM THE PRESIDENT

Dear Members,

In this issue I would very much like to tender our apologies for the long delay in the appearance of the Journal.

The root of the delay has been in the costs of publication. Up to now we have been making and publishing the Journal ourselves, which has saved considerably the cost of production if effected through outside agents.

Sometimes, however, it is not always possible, perhaps through indisposition of one of our team, to get the Journal out on time, and with our membership rapidly rising we must have professional aid if it is to appear properly and regularly.

So to-day our Journal takes on a new face, and to save our financial resources as much as possible in order to issue a compact Journal rich in interest, the Council have decided to publish it every quarter. Mercury will disappear shortly, and in its place we intend to give a three-month Sky Diary in each issue of the Journal. You will appreciate that this new arrangement will save, not only the cost of 18 sets of separate publishing, but also six lots of postages which, with now over 200 members in the Society, will contribute greatly to a larger Journal.

Every effort will be made either to increase the size of the Journal or to issue it more often as and when this becomes possible.

The Society has now moved into its second year, and I will report on its progress in the next issue of the Journal, which will contain accounts of the Annual General Meeting to be held at Chester on April 24th.

With kind regards,

Yours sincerely,

E. W. TURNER.

35a, Third Avenue, Walthamstow,
London, E.17.

ASTRONOMICAL PHOTOGRAPHY

By J. B. Hutchings.

I have recently taken up astronomical photography, and finding it such an enjoyable branch of my hobby thought that you may like a few hints on the subject.

Apart from being a very fascinating spare time occupation, photography of the sky is not a useless luxury. If you are lucky enough you may discover a new comet or nova, while checks can be made on the positions of predicted comets to help cometary observers. A daily record of the sun will be of lasting use.

Expensive equipment, as may be thought, is not required. Much sterling work has been done with the family reading glass fitted into a home-made wooden box (Fig. 1). However, if you have a spare lens similar to the one I had, you may be interested in the way I proceeded to make the camera.

The Camera. Being no engineer, though I do boast the ownership of a pair of metal shears, I set about it! Finding a tin a little larger than cocoa size, I cut a hole in one end the approximate size of the lens, in this case about 1¼in. in diameter. After removing the lid, four slits were cut to the approximate focal length of the lens, about 4¾in., which was found by the usual distant window method. Three of the four strips of metal were bent to form a holder for the plate holder, the other being bent perpendicular to the body of the tin to make a guide for use in the dark. See figs. 2, 3 and 4. Unfortunately the back plate of the lens was missing, so as a temporary measure, plasticine was used. This is my usual method of fixing anything loose—it suffices if the whole apparatus is handled gently! This home-made camera cost me 10s. 4d., all of which was spent on the plate holder. Even this can be made by a skilled man, but as I say, I am no engineer by any standards!

Plates and Films. Always use a fast panchromatic type of plate or film except when photographing the sun, when a slow pan type should preferably be used. The sun, of course, gives out to us an exceptional amount of light, and unless you have a shutter giving phenomenally fast speeds the plate will be grossly over-exposed. A filter should also be used when taking a picture of the sun. A yellow one of factor x2 to x4 should do the trick. This practice should also be carried out when photographing the moon between quarter and full.

A word about the size of the plate to use with your lens. It is best to rely on a flat field only the size of the lens being used, e.g., with 1¼in. diameter lens I am using the smallest plates available, that is, 2¼in. x 3¼in.

If you have not had any experience of plate photography before, here is just a hint on how to decide which way to put the plate in the holder. This, of course, must be done in the dark or by indirect illumination of a recommended light source. I find the most sure method is to place the corner of the plate between the lips; the side which tends to stick to your lip, more than the other, is the emulsion side. By the way, don't lick off more of the emulsion than you can help as this tends to spoil the plate! The cost of the plates I use is 4s. per dozen, which is only about a ½d. more per picture than if an ordinary film is used.

Mounting. Having no suitable mount for the camera I tied it on to the barrel of my 1¾in. telescope which has a table tripod stand.

Not very steady, I admit, but this was partially rectified by a piece of fashioned board between the camera and the telescope. This type of mounting is not very suitable for taking photographs on which are wanted spot images. That is, when you want all the stars on the picture to be points of light instead of trails. If you do want to do this a simple equatorial mounting will have to be made for the camera.

Focussing. The idea is to aim the camera at the object and focus it by sharpening the image on a piece of ground glass placed for focussing in the place of the plate holder. This is difficult to do if there ar eany awkward lights in the vicinity. For the first photograph I took I decided the object must be a polar trail. The focussing was purely guesswork because I could not see a thing on the screen owing to nearby light shining on the ground glass. The result was very curious and maddening, everything being out of focus! However, my second object on the same evening was a trail of Jupiter, taken later when no lights were on in the vicinity. This I could see clearly on the screen, and it was possible to focus the image sharply. The result was also rather curious, there being three trails of Jupiter on the developed plate. One trail was caused when the plate was put in, one when the exposure was being made, and the other when the plate was being taken out. I quickly procured a lens cover!

Developing. For my first plates I used a developer, which I had had for about four years and which had been originally bought for developing prints. Being a fine starry night I wanted to try the camera out immediately but was not able to go out and buy any new and better developer on the spot. Now, however, I have some which was recommended by the makers of the plates. This is to be found on a leaflet inside the box of plates. Needless to say, it gives much better results! By the way, the aforementioned leaflet details the developing, fixing, washing and drying, all of which I advise the photographer to do himself as it takes little trouble and cuts the cost down appreciably.

This short article has, I hope, given you a few hints to enable you to start this fascinating branch of astronomy. The rest must be gained by experience and trial and error, a case of which I gave you under focussing. The winter is the best time to start, but the coming summer can be profitably spent in preparation.

THE PRESIDENT INTRODUCES

The President has great pleasure in introducing in this issue,

Mr. H. Wildey, F.R.A.S., Member of the Hampstead Scientific Society, and this paper should be a great help for our members.

GUIDANCE TOWARDS THE FIRST TELESCOPE

By H. Wildey.

"Can you advise me on the purchase of a telescope?" How often this question is asked, and the reply can only be "How deep is your interest?" If you consider it just a curiosity to see the Moon and Planets and don't feel certain of it being a life long hobby in which you wish to take an active part the best choice is a 3in. refractor on a tripod and a steadying arm permitting a slow motion in altitude. If, however, you know yourself well enough to be sure that it is not just a passing interest the purchase of such an instrument is rather a waste of money as it will soon become evident that it is little more than a toy and its owner will soon be wishing for a larger telescope and regretting having bought so limited an instrument. A larger refractor of good quality is expensive and would need proper housing, and unless money is no object it at once becomes apparent that the choice should be a reflector of not less than 6ins. aperture and better, 8ins. Such instruments can often be purchased secondhand, but care should be exercised against getting a badly figured mirror and flat. I have known cases where a mirror has been bought at a very low price and seemed a wonderful bargain, but, alas, when it is tried out it is found to be useless and required reworking, so instead of a bargain it turned out that several pounds had been thrown away on what turned out to be merely a glass disc worth no more than a few shillings. Very often the flat is found to be just a piece of unworked glass with the front face no better than the back. There is so much of this junk on the market that I strongly advise anyone to ask for a report on these components (and this also applies to an object glass) by a qualified person disinterested in the sale. No dealer or seller who is offering a genuine article will object to this.

In most instances funds do not permit the buying of a complete telescope, and if the mirror and flat of good quality is obtained the construction of a first class instrument is well within the average amateur's means if he is capable of using a few woodworking tools such as are found in the average household. A square section skeleton tube of wood is ideal, and there are a number of books on the subject so that further description is unnecessary. One word, however, as to the mounting. While the German type of equatorial is very suitable for refractors, it is a bad type for reflectors. The best and simplest for the amateur to build is in the style of the 100in., using a stout solid north pier of concrete, going well below the ground level. Very good results have also been obtained with a cast concrete fork. Any good mounting should be very heavy and solidly constructed, otherwise it will shiver and shake in the slightest breeze, and when one considers how this tremor is magnified it can at once be realised that not much planetary detail is going to be obeserved when the object is dancing about and won't keep still.

Lastly, what sort of eye-pieces should be bought. Most dealers only supply and try and push the Huyghensian type, and while they are quite suitable for refractors and long focus reflectors around the f.12 ratio they give a bad performance with the usual reflector which works around f.8, and if shorter than this they will not give a focusable image. A few good eye-pieces are really an investment and last more than a lifetime, and the beginner is well advised to get the best from the outset. This is the orthoscopic, and it has a wide field making it suitable for general observing. The Monocentric is less expensive, but it has a very small field that limits it to planetary and lunar work, but it is ideal for this and free from ghosts. The Tolles is similar to the Monocentric and works quite well, and is even less expensive but does not have an achromatic lens. Lastly the Kellner is a cheap eye-piece, giving a wide field suitable for general use such as nebular, clusters and variable star observations.

"WHAT'S NEW?"

By C. D. Reid, F.R.A.S.

From time to time the newspapers print a story of how "Professor Strabismus has discovered another star," as if all the stars in the sky were so well known that one extra can be detected only by the most minute search. We have only to look at any part of the Milky Way through a pair of binoculars, or a small telescope to realise just how hopeless a task it would be to know all the stars in the sky. Furthermore, the number of stars we can see depends on the size telescope we use. The bigger the instrument, the more stars there are to be seen.

What the newspapers mean is that Prof. Strabismus has noticed a star of some considerable brightness where no such object has been recorded before. These new stars, or novae, as they are called, are comparatively frequent. There are a dozen or so every year, with a really bright one every five or ten years. Some of them are historically quite famous. The brightest Nova recorded was that observed by Tycho Brahe in 1572. This reached a magnitude of -4, brighter than Venus; so bright indeed that it could be seen in broad daylight. Tycho was able to fix its position to within one minute of arc—quite a feat in the days before telescopes—but his measurements were not accurate enough to allow us to say with certainty which of two stars in the vicinity is the one which flared up in 1572.

Other famous novae were Kepler's star, Nova Ophiuchi 1604 (that one reached -2.0 magnitude); Nova Persei of 1901, which reached 0.0m; Nova Aquilae of 1918, reaching -0.5m; and Nova Puppis, 1942, which attained 0.5m.

Most novae, of course, do not show such spectacular brightnesses, and usually rest content if they manage to become visible to the naked eye.

If we plot the positions of these new stars in the sky, we find that with one or two important exceptions, they lie in or around the Milky Way. This means that most are comparatively local events. Our own Galaxy is really a highly condensed spiral nebula. If we could see it from the outside, it would present something of the same appearance as the Great Andromeda Nebula. Photographs of that object—the nearest of the spiral nebulae—show it to possess masses of star-like condensations, and since its spectrum is continuous we can assume it to be very like our own galaxy. Incidentally, photographs taken at intervals show that the Andromeda Nebula suffers from novae, too.

These seem to be two ways in which one of these new stars can be caused.

Firstly, a star can run into trouble by moving into a dust cloud. Most stars travel with speeds of about twenty or thirty miles per second. At such velocities, even quite tenuous dust clouds offer very considerable resistance to a star's passage. This resistance can raise the star's temperature by a thousand degrees or so, resulting in a very notable increase in brightness. Stars which get into difficulties in this fashion are usually erratic in behaviour.

because the dust is seldom uniformly distributed. Often the star turns out to be an irregular variable with an extremely wide range of brightness.

The second and more important way of "obtaining" a nova seems to be due to the construction inherent in practically all stars. The greater proportion of stars maintain the high temperatures by converting hydrogen into helium. The reaction was first proposed by Bethe. It requires temperatures of the order of a million degrees centigrade to initiate and maintain it. It is thought that the starting temperatures were obtained due to the contraction under its own gravitational attraction of a cloud of dust. If the cloud is sufficiently large, the contraction will yield a high enough temperature to touch off the hydrogen-helium reaction, and once begun it would keep itself going in a mass of large enough size. One important point is that the range of masses for which this process is a long term possibility is quite limited. If the mass is too small the reaction will not start. If it is too large, the star blows itself up by the initial violence of the reaction. Stable masses lie in the range 10^{32} to 10^{35} grams. In that range, there is a nice balance between the attractive force of gravitation, and the disruptive force of radiation pressure. Stars low in mass tend to cool off rapidly, whilst those high in mass are unsteady and pulsate.

The whole body of the star depends on the equilibrium between the gravitational and radiation forces, and it is thought that when a star has exhausted its supply of hydrogen one of the forces holding the balance is withdrawn. This results in the collapse of the star under its own mass, and, as that happens, there will be swift and great rises in temperature. Other nuclear reactions than the hydrogen-helium one begin to be important, and a very violent explosion occurs. This is sufficient to scatter a great part of the star throughout the surrounding space, and may lead to its virtual extinction.

Novae commonly increase in brightness through at least ten magnitudes—something like ten thousand times. On the whole, this range of brightness can only be explained by some overwhelmingly violent catastrophe such as that outlined above.

If we look at the many varieties of object to be found in our own galaxy, we shall find stars grouped in all sorts of circumstances. Not only are there individual stars; but also stars in open clusters; in more condensed globular clusters; mixed up with knots of bright nebulosities; and associated with dark dust clouds. Indeed, the appearances of a number of familiar objects are much modified by dust clouds of sometimes fantastic shape. The well known "Horse's Head" in Orion, and the holes near the "North America" nebula are two examples.

It is significant to point out that one of the most famous of all variable stars is Eta Carinae, which is embedded in a mass of nebulosity. Some of the nebulosity is bright, some dark. The story of this star begins in 1603, in which year Bayer noted it as 2mag. Later, in 1677 Halley saw it at 4th mag. By 1685 it was again at 2nd mag., and in 1751 Lacaille saw it still at that brightness. However, early in the last century it had sunk again to the fourth mag. By 1822 it was back again at 2nd, and, after a few minor fluctuations, shot up suddenly to 0.0 in 1832. It fell again after a very short time, to rise again in 1843 to -1.0 mag. At that time only Sirius exceeded it in brightness. From that time, the star faded, sinking to about the eighth mag, and with minor variations it has remained at that level since. It is of some interest to note that the brightness of this star is not the only thing which has varied—it used to be called Eta Argus.

Although Eta Carinae is not a nova, if for no other reason than that it has always been known, its variations of light put it almost in the nova class. To-day we cannot be sure whether a fresh outburst is to take place or not. Unfortunately, its position at declination S59° 25′ makes it quite unseeable from this country.

Novae of the explosive type have often given birth to nebulosity of one sort or another. Both Nova Persei and Nova Aquilae produced masses of rapidly expanding hot gas, movement of which could be photographed without much difficulty. And the Crab Nebula in Taurus seems to mark the place of the nova seen by the Chinese in A.D. 1054. It gives food for thought when we realise that the Crab Nebula also appears to be the source of strong radio waves.

There seems little doubt, then, that the event described by the newspapers as a "New star" is really the final appearance of a star in the process of demolishing itself, or at least, in very great trouble.

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