

$\eta$  ARGUS AND ITS SURROUNDING  
NEBULA, &c.\*

IN the last paper I had the honour of bringing before the Society, I referred to a correspondence which was then pending on the star  $\eta$ , and the attached nebula, in the constellation Argo-Navis. It will be fresh in the minds of many of the members of this Society that authorities, previously quoted, have confirmed the alterations that have been recorded in this object. Mr. E. B. Powell, of Madras, writing to the Royal Astronomical Society some observations on the binary star  $\alpha$  Centauri, has a concluding note thus:—"I have to observe that to Mr. Abbott must be ascribed the first publication of the fact that  $\eta$  is no longer in the dense portion of the nebula, where it was seen by Sir John Herschel."—(Vide Monthly Notices R.A.S. vol. 24, p. 172.)

It was in March 1865, that I first pointed out the fluctuations in this object, through the Melbourne equatorial, to Mr. Ellery at the Observatory, when the star  $\eta$  was out of the nebula, and the altered figure of the dark space was filled with 12th magnitude stars, richly coloured as described in Monthly Notices R.A.S., vol. 25, p. 192.

Notwithstanding this in connection with all other evidence, strong opposing influences have been brought to bear against the movements which have been observed, although it is well known to every astronomer that there is nothing stationary in the universe. The distance of such objects as the nebula about  $\eta$  Argus is in all cases so immensely great, their position in the sky often unfavourable, and convenient times for observing so far apart, that any alteration or physical changes may for centuries remain unknown.

The late Sir William Herschel writes, and is followed by Sir John, thus:—"Gravitation still further condensing and so absorbing the nebulous matter, each in its immediate neighbourhood might ultimately become stars, and the whole nebula finally take on the state of a cluster of stars," &c.—(Vide "Outlines of Astronomy," 5th edition, p. 640.) Mr. Proctor considers that an increased or decreased distance in space may account for the fluctuations.

The present object was observed and faithfully recorded by Sir John Herschel, when stationed at the Cape of Good Hope in the year 1837. It is quite impossible to say what, if any, alterations may have taken place in the nebula before that time; but it is certain that changes have taken place both in the star and in the nebula since 1854, and these fluctuations have been so great and unusual as to raise a doubt in the mind of Sir John Herschel as to their reality. This opinion, coming from such an authority, has influenced many others, who, notwithstanding all evidence, and without a single observation of their own, have refused to credit these recorded facts. Some also, who have but lately commenced observing, contrary to all scientific rule, ignore all previous observations made by others, in order to make an opening for their own.

To decide certain points of difference which are said to exist between the drawings made by Sir John Herschel, Lieut. Herschel, and myself respectively, referees have been appointed by the Council of the R. A. S. The present paper has relation to the observations made for, and the reply sent to, the referees, in answer to their queries on the points alluded to.

In carefully looking over the drawings taken at Bangalore by Lieut. Herschel, with the object  $\eta$  Argus,  $15^\circ$  above the horizon, and also the reversed copy of Sir J. Herschel's, and on consideration of the discussion given with the drawings, I do not think that Lieut. Herschel's observations tend to disprove any one of the alterations which I have previously communicated to the Society. The present drawing, and the answers given to the referees, will, I think, render this clear.

The present observations have been made with the same instrument as the former ones, the object in the same position—approximately  $80^\circ$  above the horizon. The measures were taken with a bar micrometer by Cook and Sons, the bars being carefully traced in pencil on the drawing paper, in such a manner as exactly to fill the field of the telescope. All the stars visible were dotted down, the distances from  $\eta$  of the 6th, 7th, and 8th magnitude stars were lettered, measured, and catalogued from a scale of equal parts, after which the micrometer pencil lines were rubbed out, and the nebula inserted.

The first question put by the referees relates to a comparison of the positions of the principal stars and smaller groups as shown

in my two drawings, which are said to have a sufficient general agreement with each other, considered as eye drafts, while they are irreconcilable with both Sir John's and Lieut. Herschel's configurations. A simple inspection of my drawing of 1870 with the reversed drawing of Sir John Herschel (A. A., plate 4 in the Monthly Notices R. A. S.) will show that the following principal stars hold a relative position considered as eye drafts, but not with the Cape Monograph as expressed in the letter D. D., C. C., ( $\beta$ ), ( $\kappa$ ), B. C., (E.), 522, 558, 640, 337, 383, 415, ( $\gamma$ ), ( $\lambda$ ), &c., &c. There are many other stars in my copy of 1870 that are not laid down in plate 4, pricked off from Lieutenant Herschel's drawing.

The other question of note refers to my "having placed within  $11\frac{1}{2}'$  (on the scale of my drawing of  $\eta$ ) five stars of magnitude at least equal to  $\eta$ , that is, the 7th magnitude, while in Sir J. Herschel's monograph only one star of that magnitude (marked C.) occurs within that distance;" and continues, "can you give any elucidation of the cause of the discrepancy? also if you would furnish some instrumental determination of the difference of R. A., and P. D., between  $\eta$  and other stars of equal magnitudes."

In my acknowledgment of this letter to Mr. William Huggins, F. R. S., &c., I mentioned that it was not my intention or desire to dispute either Sir John's or Lieutenant Herschel's configurations, but to call the attention of the astronomical world to the altered features of both the star and the nebula, with a view of obtaining a solution of the changes seen in this most remarkable object. I further stated that the above question was of a physical nature, and could only be answered as such.

On reference to my former papers, it will be seen that mention is made, more than once, of the fact that the increase of stars of the same magnitude as  $\eta$  renders it difficult to know that star from others, but by its position, and a marked difference in the light.

It is to this cause I have so frequently referred the increase of light, which I think is now clearly confirmed by a comparison of Lieutenant Herschel's description with that of Sir John's. At one of the monthly meetings of the Society, Sir John Herschel considered the increase of light in the object, as recorded, very strange, and remarked, "when I was at the Cape the nebula could not be seen at all with the naked eye." Lieutenant Herschel, when at Bangalore, compared the increased light, when the object was only  $15^\circ$  above the horizon, to that of Pleiades in Taurus.

Mr. Le Sueur, in his report on the Melbourne reflector, says "the nebula around  $\eta$  Argus has changed largely in shape since Sir J. Herschel was at the Cape. The star shines with the light of burning hydrogen," and in his opinion "has consumed the nebula."

At the monthly meeting of the Royal Society of Victoria, held on the 13th of March, 1871, Mr. Fairlie McGeorge, who has now charge of the reflecting telescope at the Melbourne Observatory, read a paper in which he referred to some observations made with that instrument on the star  $\eta$  Argus, and the nebula; and stated "that the object had evidently undergone great changes since Mr. Le Sueur made his sketches of it. It was now beyond a doubt that enormous physical changes were still taking place."

The catalogue accompanying my present drawing, made for the referees, and laid on the table, will show that there are now in the same field two stars of the 6th, two  $6\frac{1}{2}$ , three 7th, four  $7\frac{1}{2}$ , four 8th, and nine of the  $8\frac{1}{2}$  magnitude, and it is literally crowded with others of from the  $8\frac{1}{2}$  to the 12th magnitude. Those lying outside the field and occupying an area of about  $1\frac{1}{2}'$ , have their magnitudes attached. The small cluster I take to be Sir J. Herschel's 3276, described as "a fine, bright, rich, not very large cluster," if so it is now a beautiful cluster of richly-coloured stars, quite equal to  $\kappa$  Crucis.

It is almost impossible to define the boundary of the nebula, as it appears to be gradually fading away, and is not so distinct in outline as formerly.

The finest nights have always been selected for observing, and no delineation of the object has ever been given, but what was an accurate representation of its appearance through the telescope.

The following is an extract from a letter addressed by Mr. Severn, of Melbourne, to the Astronomer Royal, and printed in the Monthly Notices, Royal Astronomical Society, for April, 1870:—"I may say that I cannot confirm the new position given to  $\eta$  Argus in respect to the nebula. I have watched it for fourteen years, and it is just where it was; of course much less brilliant."

A letter dated 21st June in the same year which I received

\* Read at a meeting of the Royal Society of Tasmania, 9th May, 1871.

from Mr. Severn contains the following passage:—"My present motive is to draw your attention to the injustice done you in the  $\eta$  Argus business; I have of course read all your letters in the Monthly Notices of the R.A.S. on the subject. You must not allow the *Spectator*, or Mr. Le Sueur, or any other man to deprive you of your discovery; you have at least done, and that years ago, what the 4th. Cassegranians and Mr. Le Sueur are claiming as their discovery. I can't stand this, and therefore if you don't defend yourself, by writing to our papers, I must. I send you a *Leader* with my paper in it, also another *re*  $\eta$ ."

On reading these two extracts, which are dated about the same time, it will appear that the writer must have very suddenly changed his mind.

In June 1869 I visited Melbourne for the purpose of seeing the new large reflecting telescope, and must confess to being much surprised on seeing the object  $\eta$  Argus in such a small field with so large an instrument. Mr. Le Sueur thought at the time that he saw a faint shadow of a lemniscate; and what I saw was a dark path across the nebula, not unlike that portion of Eridanus, occupied by  $\epsilon$  188 and  $\epsilon$  198 l. C. and not far from the star Achernar. The object was only seen between passing clouds, and although the best speculum was in the instrument at the time, the definition was not good.

In June 1862 I brought before this Society a copy of the drawing made from observations on that beautiful cluster of coloured stars known as  $\kappa$  Crucis, the original drawing, &c., of which was at the time remitted to the Royal Astronomical Society, with notes on the variation of both colour and position when compared as eye drafts, with Sir John Herschel's observations made at the Cape of Good Hope. (Vide Monthly Notices, R.A.S., Vol. 23, p. 32.)

As the instrument used at the Cape was in every respect different from the one used in Hobart Town, and the effect of colour varying, as it does, so much in different persons, I discontinued observing to allow time for other changes to become known, and have now waited nearly nine years, in order to compare the object with the previous drawing by the same optical means. Sir John Herschel estimated this cluster to be formed of from 50 to 100 stars; in the drawing of 1862, a copy of which now lies on the table, there were laid down 75 stars to which the colour of each was given. It is now known that certain alterations have taken place since 1862, but a series of cloudy nights has prevented the possibility of preparing a sequent to the former drawing in time for the present meeting. F. ABBOTT

### SCIENTIFIC SERIALS

*Transactions of the Manchester Geological Society.* Vol. ix., Parts 1, 2, and 3; Vol. x., Part 1. We have in these first three parts the President's Address and the papers read before the society during the session 1869-70. The papers are twelve in number, and embrace a variety of topics. Mr. Boyd Dawkins gives an account of some explorations in the Denbighshire caves. In one of these a large quantity of human bones was found intermingled with remains of horse, goat, hare, rabbit, badger, large birds, wolves, wild cats, foxes, and Celtic short-horns, roe and red deer. He is of opinion that this cave has been used as a burial place at different times in the pre-Roman era. The skulls found belong to that type which Professor Huxley terms the "river bed skull," and the tibias indicated the platycnemid character or the bandy-leggedness of the people to whom they belonged. There are other three papers on palæontological subjects—"On a Specimen of *Homalonotus Delphino-cephalus*," by Mr. Edward Holber; "On some Starfishes from the Rhenish Devonian Strata," by Mr. J. Eccles, and "On two Species of *Productus*," by the same author. To these may be added another by the president, Mr. J. Aitken, "On the Pholad-boring Controversy," in which the author concludes, against the notion upheld by Mr. Macintosh, that the holes found in the faces of certain limestone rocks at many different levels, even as high as 1,435 feet above the sea, have been bored by pholades during a period of submergence. He inclines to the belief that the holes have been formed by land molluscs, as originally suggested by Dr. Buckland. There are several papers on physical geology, which will repay perusal. The longest of these is one by Mr. Spencer, "On the Millstone-Grit Rocks" of Halifax, which will be of use as a guide to that locality. The author distinguishes four beds of grit separated by intervening

thick shales. Lists of fossils are given, and these are not so meagre as one might have expected. Mr. J. Curry has a paper "On the Throw of the Pennine Fault," which he thinks is not so great as is commonly believed. Some interesting "Observations on the Temperatures at the Pendleton Colliery," by Mr. J. Knowles, are sure to be frequently referred to. "On some of the Causes of the Different Modes of Working and Ventilating Coal Mines," by Mr. Warburton, contain some wholesome criticism. He maintains "that the systems of working coal, as at present practised, do not depend upon the nature or condition of either the coal or the roof, but upon the mining education of those who have the management." Difficulties in the way of ventilation arise from ignorance and from the modes of working often interfering with well-known natural laws. Other papers in Vol. ix. are "On the Use of Gunpowder in Mines," by Mr. Greenwell; "On two Dykes in North Lancashire," by Mr. Eccles; and "Observations on some Specimens of Silver Ore from United States," by Mr. Fletcher. Part 1. of Vol. x. is occupied for the most part with the President's address, inaugurating the session 1870-71. Mr. Aitken treats of our coal supply in its various aspects, and a number of other, chiefly palæontological, topics. The other communications in this part do not call for any special remark. They are three in number, viz., "The Spirorbis Limestone in the Forest of Wyre Coal Field," by D. Jones; "On Faults in Drift," by J. Aitken; and "On the Underground Conveyance of Coals," by G. C. Greenwell. We are glad to see from the report of the Council that the Society is flourishing, and that the number of contributors to the Transactions is increasing.

*Verhandlungen der k. k. geologischen Reichsanstalt zu Wien.* Nos. 8 and 9 (1871). No. 8 contains the usual short summaries of papers and reports, among which may be mentioned one on the last earthquake and the hot springs and solfataras at Milo; and another on the Tertiary Land-fauna of Central Italy, by E. Suess. The other papers are more of local interest, but a number of useful analyses of minerals is given. Among the notices of contemporary publications is one of a work by Dr. Prestel, on the Climatal and other Changes which the Coasts of the North Sea have undergone since Glacial Times. In No. 9 will be found a short account of a Coast Survey of the Adriatic Sea. The survey when completed will, it is expected, make the bed of this sea as well known as that of any other which has been explored. The bottom of the south basin of the Adriatic is covered throughout, it would seem, with a yellow sludge or slime, which is brought down by the large rivers of Albania. In this same area a remarkable rocky plateau rises up from the slimy sea-bed, at a depth of from 325 to 370 fathoms to within 100 fathoms of the surface. Some details of other parts of the sea bottom are given. The number contains several other reports, among which we find some account of the Library of the Institute, which would appear to be in a flourishing condition. The usual literary notices and lists of books received conclude the number.

### SOCIETIES AND ACADEMIES LONDON

Royal Microscopical Society, October 4.—Mr. W. Kitchin Parker, F.R.S., President in the chair. The first meeting of the session was held on Wednesday evening. Mr. Parker contributed a valuable paper "On the Development of the Facial Arches of the Embryo Salmon," at the conclusion of which he expressed his opinion that the development of the brain case of the osseous fishes demonstrates that group to be much closer allied to the Saurapsida, or Birds and Reptiles, than it is to that of the Batrachia, or Frog tribe. Mr. Parker highly eulogised the use of chromic acid as a medium for hardening without distorting the substance of the brain when required for sections.—Dr. Spencer Cobbold handed in a report on some preparations of Entozoa with accompanying notes, forwarded to the Society by Mr. Morris, of Sydney, and made observations on some of the most interesting forms. Of the five species collected by Mr. Morris, Dr. Cobbold stated that by far the greatest amount of importance was to be attached to the discovery in Australia of *Stephanurus dentatus*. This Entozoan was introduced to the scientific world as early as the year 1834 by Natterer, who found it in large quantities infesting the adipose tissues of a breed of Chinese pigs, on the Rio Negro in Brazil. Up to the year 1870 nothing further was heard of this parasite, when Dr. Cobbold received a communication from Prof. Fletcher, of New