

strong underground current. On the flat country we used to dig out waterholes, so that the stock could water at them. They would be from 10 to 12 feet deep, sometimes less where the ground was of a stony character. I have seen fish from 4 to 7 inches long come into them. They had eyes, but did not appear able to see, as they did not try to escape. They were tasteless to eat and shaped very much like an eel.

"On another part of the run there was a low-lying range. About the middle of this I took out a waterhole, and into this one came leeches—the same kind as doctors use. The hole had no communication with any swamps."

Astronomy of the Australian Aborigines.

By the REV. PETER MACPHERSON, M.A.

[Read before the Royal Society of N.S.W., 6 July, 1881.]

It is not my purpose merely to give a list of aboriginal names of stars and constellations. Looking over the materials to hand, and setting forth the astronomical knowledge possessed by aborigines of Australia, I have tried to find points of interest to which special attention might be directed. Are there traces of systematic arrangements of the stars? There are, indeed, evidences of imagination in tracing resemblances between objects on the earth and the outline formed by certain stars. Thus, we have the Northern Crown forming the curve of a boomerang; a group of stars in the Lion (as it appears to me) exhibiting the shape of an eagle's claw; the Crow, as a kangaroo; the Coal-sack, as the body of an emu; the stars composing the Dolphin, as a great fish; and the streams of stars in Berenice's Hair, as a tree with three principal branches.

But there are more important materials than these to consider. As to the literature of the subject, the most valuable paper on aboriginal astronomy which I have been able to find is one read by Mr. W. E. Stanbridge, before the Philosophical Institute of Victoria, as far back as the 30th September, 1857. It is published in the second volume of Transactions of the Institute, at pages 137-40. The information contained in it was obtained from a tribe called the Boorong, who dwelt about Lake Tyrill, in the Mallee country in the west of Victoria. The more important systematic arrangements regarding the stars, as indicated in the paper, will be briefly stated, as introductory to other systematic arrangements of an astronomical character, which are not stated by Mr. Stanbridge, but which can nevertheless be gathered from materials he has supplied. We learn that a mythological connection was made between certain stars and the seasons of the year. Thus, the Pleiades (*Larnankurk*) are a group of young females playing to a corroboree party of young men (*Kulkumbulla*), represented by the belt and dirk of Orion. The red star Aldebaran, *Gellarlec*, or rose-crested Cockatoo, is an old man keeping time to the dancers. This as a summer group corresponds well with the beautiful moonlight nights of November and December, when the air is balmy, and the signs in the heavens are the resplendent groups of Orion and the Pleiades, with such

individual bright stars as Sirius and Aldebaran. As the year advances we come to the Twins, who are two hunters, *Yurree* and *Wanjel*. These pursue and kill Capella, which in the aboriginal mythology is called *Purra*, and represents a kangaroo. The mirage is the smoke of the fire at which *Purra* is cooked by the successful hunters. The corroboree party and the hunting party fitly enough form two groups to set forth the period of summer, and the arrangement has a poetical character about it. Moreover, as an isolated point, the breaking up of a prolonged drought is thus set forth: Berenice's Hair, which is in the meridian at midnight in the month of March, is a tree with three principal branches. Now, although a shower of rain has come, the dusty and gaping earth has soaked up every drop of water that has fallen upon it. A small cavity, however, formed at the junction of the three branches of a tree retains some of the precious fluid, and here a number of birds are represented as drinking, and the scene is transferred from the earth to the skies.

The winter also has its ruling stars. These are Arcturus and Vega. Arcturus is known by the name *Marpeankurrk*, and is held in great respect for having taught aborigines where to find pupa of the wood-ant, which during August and September forms an important article of food. Vega in Australian mythology is *Neilloan*, or the Mallee-hen, elevated to the rank of a goddess. She too is held in much esteem for having taught them how to find eggs of the Mallee-hen, which also form an important element of food during October. Here then are two representative stars, corresponding with the two representative groups of stars which fitted to the summer-time. The guiding ideas in one case are the corroboree and the kangaroo hunt; in the other case, the discovery of pupa of the wood-ant and eggs of the Mallee-hen.

As to the south polar region, we might almost expect that such a conspicuous group as the Southern Cross would figure in aboriginal legends. In their oral literature the Cross is a tree which affords safety to *Bunya* (the Opossum) that was pursued by *Tehingal* (the Emu). The story goes that he in fear left his weapons at the foot of the tree, and was changed into an Opossum for his cowardice. *Tehingal* appears to be the impersonation of evil, and is identified with the Coal-sack. The figure of this dark space somewhat resembles the rough outline of the body of an emu, and hence it would seem that the dusky figure of the emu is accepted as the impersonation of evil. The Pointers are two great warriors who spear and kill *Tehingal*, and their spears stick into the tree at the two points represented by the two nearest stars, one in an arm, the other in the foot of the Cross. Aboriginal theology seems specially connected with the south polar region and the Southern Cross. The magnificent star Canopus is called War, or the Crow, which occupies a most distinguished

place in aboriginal legends. Canopus is the male, and the small red star No. 966 in King Charles' Oak, the female Crow. Strangely enough the Crow represents the benefactor of the aboriginal race. He is the Prometheus, the fire-bringer, whose good deeds are celebrated in fire-legends over the greatest part of Australia.

Having got something like systematic arrangements, the question occurred whether other arrangements might be discoverable from the materials Mr. Stanbridge supplied, though they were not pointed out by him. Thus we find that Arcturus (*Marpeankurrk*) is the mother of Antares, which the Boorong people called *Djuir*. Then again, Vega (*Neilloan*) is the mother of *Totyarguil* (*Atair*) in *Aquila*. Moreover, two small stars placed closely together near the head of *Capricornus* represent the fingers of an uncle of *Totyarguil*. This warrior had been killed by *Bunyips* in the water, but his remains were rescued by his uncle, whose name was *Collenbitchik*. The two little stars are his fingers feeling for the shore. Thus mythological associations connect Arcturus and Antares as one; and Vega, *Aquila*, and the small stars near the head of *Capricornus* as another family group.

With these materials we can determine the principle on which a systematic grouping has been made. Three stars near each other, and in a line or nearly so, form a starting-point. Hence we have the three stars in Orion's belt, the three in the Scorpion, with Antares in the middle, and the three in *Aquila*. All are brought into service. These three triads of stars are of such a character as to strike the eye at once. They stand out in a very marked manner from all the stars about them. Those who accustom themselves to observe the stars become familiar with these triads, and could distinguish any of them at once, supposing the whole of the sky beside should be clouded. The three stars in Orion are the most regular in size and position. Of the three stars in the Eagle group, the one in the middle is by far the largest; and of the Scorpion group, the one in the middle is not only the largest but it is also the red star, Antares, the rival of the planet Mars, which sometimes comes in the vicinity of it. But besides the smaller groups of three, there are plainly the larger groups of three. Each triad indicated consisting of stars near together, becomes, as a whole, a starting-point to be associated with other points to form a new linear group on a larger scale. Hence we have Orion's belt, Aldebaran, and the Pleiades forming a much longer line across the heavens. The triad of stars in the Scorpion becomes a starting-point from which a line is prolonged to Arcturus. A similar arrangement prevails in regard to the triad in *Aquila*. The line is prolonged to the two stars near the head of *Capricornus* in one direction, and to the brilliant star Vega in another. Thus the triadic arrangement is fully carried out in three out of four groups.

The arrangement in regard to Totyarguil is not injured by his boomerang being sent out of line to occupy the curve of the Northern Crown. Moreover, only two points are given in the group connecting the Scorpion group and Arcturus. Now it happens that Mr. Stanbridge mentions two small stars in the end of the Scorpion's tail, *Karik Karik* (Falcons). These with Antares and Arcturus would make a line corresponding closely with the line of which the *Aquila* group forms the centre. The two small stars near the head of Capricornus bear a close analogy to the two small stars in the end of the Scorpion's tail. Mr. Stanbridge, however, though he mentions the stars as *Karik Karik*, does not mention any mythological circumstance connecting them with Antares and Arcturus. The principle of grouping thus developed will explain why some bright stars are not named amongst those given in Mr. Stanbridge's paper. Such bright stars as Procyon, Spica Virginis, Regulus, and Fomalhaut are not mentioned: they are isolated stars, though bright—they do not readily fall in with any mechanical grouping of stars.

Moreover, the aboriginal astronomers who constructed the system we are unfolding were content with three points in a line. This is very noticeable in the case of the group embracing Orion's belt, Aldebaran, and the Pleiades. Those engaged in making out this mechanical arrangement could scarcely have failed to notice that Sirius, in all its splendour, would have formed a fourth point in a line stretching from the Pleiades, yet it is not included in the scheme. Sirius and Rigel are connected as the male and female eagle (*Warepil*), respectively, as if to put Sirius out of association with the group of dancers and musicians. The straight line joining three points was the one object sought by the stargazers of the Mallee Scrub. No indications of triangles or squares exist. The four stars, Scheat, Alpherat, Algenéb, and Markab, form a tolerably good square, but it is not introduced into the system. Though very conspicuous, the stars are not even named. This is the more to be noticed because they occur in that part of the heavens where no linear arrangement exists to suit the ideas of aboriginal astronomers.

The important points not noticed by Mr. Stanbridge, but discoverable from the materials he has supplied, are:—

1. A systematic grouping on the basis of linear arrangement.
2. Four linear groupings are tolerably parallel to each other.
3. All are tolerably parallel to the horizon as they make their appearance in the evening sky in their several seasons, in south latitude, about 36°, which is that of the Mallee Scrub about Lake Tyrill, in Victoria.

Here there is an ingenious utilitarian scheme of the stars. I have seen various attempts made to group these bodies in a mechanical manner, so as to assist observers in acquiring facility

in distinguishing the different stars, but I do not remember any of them so successful as this. Necessity is the mother of invention, and no doubt the circumstances of aboriginal Herschels of the Mallee Scrub contributed to their success in the matter.

The name *Aquila* is perhaps preserved in the aboriginal name,

TOTYARGUIL.

Let us follow a different line of inquiry. Glancing over the aboriginal combination of astronomy and mythology, we find that early occupants of Australia acted much in the same way as the early inhabitants of Europe and Asia. Heroes and heroines have been translated from the earth to the skies. If in other lands the Lion and the Bear and other animals have been elevated to the heavens, we find that Australian aborigines have also done as much for the kangaroo, the opossum, and other Australian quadrupeds. When we come to birds, we find the eagle, the crow, and other birds fixed in the mythological skies by inhabitants of Asia and Europe, and by those of Australia. Reptiles and fishes have been honored also by them; nor has the vegetable kingdom failed to supply a tree to match the Oak of King Charles. The question occurs, whether anything can be made from a careful scrutiny of the materials thus generally brought before our notice. In the Greek mythology the Pleiades formed a group of young ladies, who were the daughters of Atlantis. In the Australian mythology, the same group appears as a group of dusky damsels, as we have seen, playing to the band of men in Orion going through the evolutions of the corroboree. This we learn in Mr. Stanbridge's paper. From works of the late Rev. W. Ridley we learn that in other parts of Australia, as on the east coast, and inland near the Barwon, the Pleiades are also represented as a group of young damsels. In the old Greek mythology the faint Pleiad, Merope, is obscure compared with the others, because she married a mere mortal, while her sisters wedded divine personages. In Australian mythology the same Pleiad is represented as being ashamed, and hiding behind the rest on account of her defective appearance. All this is worthy of note, but without some other points of identification it would be needless to set down the similarity between the two mythologies as evidence that one was derived from the other, or that both were derived from some older source. To liken a glittering group of stars to an assemblage of young damsels is a suggestion which would quickly occur to those concerned in making out resemblances and analogies. Even the special notice of the less brilliant Merope is so near the surface of observation that it would be unsafe to found much upon it. These coincidences, however, should be

noticed, as in the course of further investigation other circumstances may come to light which would invest them with new value and importance.

The cluster of stars belonging to the Dolphin occurs in Mallee astronomy as the Great Fish. But here again, as the outline of the group is not unlike that of a fish, the resemblance might easily be noticed by independent observers. We have seen that eagles and crows, as well as other birds, have been elevated to the skies. Unfortunately, however, the aborigines have sent up so many eagles and crows, that the probabilities in favour of identification are lessened thereby. Sirius and Rigel are male and female eagles. Altair and Vega (according to Mr. Ridley) are both eagles, and the Northern Crown is their nest. One of the Twins appears also to be an eagle. As regards identification, the Crow of celestial maps is replaced by the Kangaroo of Australian mythology. The bright star Altair or Atair, in the constellation Aquila, occurs as an eagle in the astronomical notices collected by Mr. Ridley. Here then is eagle for eagle. Unfortunately, however, the value of this identification is seriously weakened by the consideration that, as we have seen, a number of other very bright stars have been chosen to represent eagles. At any point, then, can we make anything out of the names? Our inquiry now will bring us into contact with philology, with which, however, it is our purpose to deal only in so far as it comes before us. That the roots of some aboriginal words are the same as those of the languages of Asia and Europe has often struck observers. Collins and Mundy, Miles, Hull, and Bennett, as also the Reverends Threlkeld, Ridley, and Taplin, may be mentioned as having pointed out words bearing close resemblance, in meaning and stem-letters, to words in Asiatic and European languages. As regards our present purpose, some ground exists for believing that the name *Totyarguil* not only refers to an eagle, but also contains, in the latter part, *arguil*, the same root as the Latin *aquila* itself. Let us then examine the name *Totyarguil*, the aboriginal name of the star Atair, in Aquila. That it applies to the bright star of the group rather than to the group itself need not stop our progress. The particular often expands into the general, and conversely, the general often concretes into the particular. Moreover, the fact exists that Ptolemy applies the name eagle (*aetos*) to the bright star itself.

The first part of the word—*Toty*—is easily discovered in the vocabularies to be an abbreviated form of the word *tourte*, which means a star. *Totyarguil*, then, means the star *Arguil*. The word *tourte* reminds us of the Greek *teras-teratos*, a wonder, a sign, a heavenly sign. There is also the plural epic form, *teirea*, signs—heavenly constellations. On the shield of Achilles, made by Vulcan, the poet tells us, "The earth and sky and sea; . . . and all the stars (*teirea*) with which heaven is crowned," were represented.—(*Iliad*;

B. xviii, 484-7.) The root is wide-spread, being found in the Persian, Zend, and Sanscrit of Asia; in the Gothic, with its numerous modern descendants in Europe; in the Latin, with its numerous descendants; in the Greek, and in the Armoric branch of the Celtic language.

It may be here noticed that the sibilant, the letter *s*, is almost wholly wanting in aboriginal dialects. Now, although it occurs in so many roots, the Sanscrit and the Greek supply forms which dispense with it. At the same time these forms appear to be accepted as of the same root with the forms referred to which possess the sibilant. In Sanscrit, we have *staras* (pl.) and *tara*, star; in Greek, *teras* and *teirea*, as well as *aster* and *astron*. The peculiarities which appear in lists of aboriginal words for eagle and birds of that description are all in accordance with the well-known principles of comparative grammar. The letters *g*, *k*, with *c* and *q*, as also with the aspirate forms *gh*, &c., all belong to one class of letters, and are interchangeable. The Latin *aquila* becomes *aguila* in Spanish, *aigle* in French, and *eagle* in English. In aboriginal lists it will be noticed that stem-letters, represented by *kl*, *gl*, *cl*, are found in words along the eastern side of Australia, from Cape York to Victoria, and even to Oyster Bay in the south-east of Tasmania. There is one word of special interest; it is the word *Coolapatamba*. This is the aboriginal name of Mount Cairncross, in New England. The meaning of it has been preserved by Lieutenant Breton ("Excursions in New South Wales, &c.," p. 245; London, 1833.) It means, "Where the eagle drinks," and it is as poetic as it is stately. It will be noticed also that the part *Coola* agrees closely with the forms *Couel*, *Karwool*, and *Kowool*, the words for eagle in localities in the same general district in which Mt. Cairncross is situated. The presence of the letter *r* in *Arguil* requires to be noticed. It is most easily introduced into places to which it does not belong. Thus in aboriginal words for crow, we have such spellings as *wah*, *wau*, as well as *war*. Now although these are no doubt imitative of the croak of the bird itself, the vibratory letter has found its way into some of the forms. In other forms for the name eagle, we find this same peculiarity with regard to the letter *r*. Thus there is *waa-pil*, an eagle, and also *war-pil* an eagle. It will be noticed, of course, that there are other forms in *gl*, &c., the stem-letters of *aquila*, in which no *r* occurs. As to the various forms beginning with *ul*, *wl*, *bl*, *pl*, *ml*, the first two of these indicate the mere difference between English and Continental spelling. Thus the *Ulce* of Bishop Salvado is obviously the same as the *Woljar* of Sir George Grey. We have an *r* in the one which is not in the other. The word *Woljar* is not unlike *Vulture*, and it means a vulture. As to the other forms, they arise from the well-known variations which characterize the labials: *p* aspirated becomes

ph = f; b aspirated becomes bh = v; the form in m is the appropriate nasal to the labial class, as may be seen in Bopp's Comparative Grammar. Looking down the column of aboriginal words for eagle and some of the birds of the same class, it is very noticeable how persistent is the root in the various forms bl, pl, wl, ml. Accretions occur prefixed to the root, and also accretions suffixed, but the root strikes deep through all.

The dropping of the initial stem-letter in a number of the forms requires to be noticed. An inspection of the rows of words given from the vocabularies of aboriginal words leaves no doubt that it is the same root which is perpetuated through the series, though with many modifications. The chief modification is the dropping of the initial stem-letter represented by g, k, q, or c; but this is a well known phenomenon in languages examined and compared by philologists. Thus, when a dental and a labial come together the initial dental sometimes disappears. *Duellum* or *dvellum*, losing the *d* becomes *bellum*. Again, a guttural and a liquid may come together and we find the guttural dropped. In the case of *kmelan*, black, we have two forms, *kelainos*, and *melan*, in which latter case the initial guttural is dropped. We are also familiar with such peculiarities as in *guerre* of the French being *war* in English, *gwin* of the Welsh being the *vinum* of the Latin. In these cases the guttural at the beginning disappears and is replaced by a letter of the labial class. In English itself we have the guttural in *guard* disappearing before the labial *w* in *ward*. As to the two forms, the longer and the shorter, the one with and the other without the guttural at the beginning, it is only proper to point out that they are both represented in the languages of Europe and Asia. The Latin *aquila*, with its modern Spanish representative *aguila*, closely resembles the *agal-eg* of Cape York, the *wali* of the Malay and Arabic languages, the *willo* of South Australia.

The aboriginal name *Totyarguil*, with modifications, seems to reappear both in South Australia and Tasmania. In the former of these Colonies we find the word *Wiltutti*, meaning a season of the year. Now, if *Totyarguil* means *star-eagle*, it would seem pretty plain that *Wiltutti* exhibits the same roots with the order reversed. Another South Australian form is *Willutti*, which means *spring*. This agrees with the twofold division between the summer group and the winter group, the eagle group belonging to the latter. Again, the vocabulary of Messrs. Teichelmann and Schürmann gives the word *Willo* as meaning an eagle, and *Witto* as both a star and an eagle. This last appears to be a mere contraction of *Wiltutti*, the season of the year in which the star—the eagle—is a ruling sign in the heavens. These associations seem to fix *Totyarguil* and *Wiltutti* as really the same name. The occurrence in South Australia of the name *Wiltutti*, which

appears to be compounded of the same roots as *Totyarguil*, is not very wonderful, considering that the Mallee country extends far into South Australia. The occurrence of the word *Weelaty* in the south-east of Tasmania is more noticeable. This word means an eagle, and readily takes its place with the South Australian words *Wiltutti*, a season of the year, and *Witto*, which means both a star and an eagle, and presents so much of the appearance of being a mere contraction of *Wiltutti*. The materials under review seem to show that the root of the aboriginal word for eagle is the same as that of the Latin *aquila*. We have seen that it is no mere isolated root; it is wide-spread over the whole of Australia, being found in dialects in Queensland, New South Wales, Victoria, Tasmania, South Australia, and Western Australia. The only portion in which the root does not occur is the north-west—a territory, however, in regard to which the vocabularies are few. In the meantime, at least, the root may take its place with such others as have been pointed out from time to time, and some future inquirer, on a wider basis of induction, may be in a position to decide how far such words are mere coincidences, or how far they prove that the ancestors of the aborigines were one with those whose descendants have spread over Asia and Europe. In conclusion, I desire to say that the region called the Mallee Scrub was visited some time ago by a special representative of the Melbourne *Argus*. He describes the portion which belongs to Victoria as a triangle, whose sides are about 200 miles in length. The area is about 13,000,000 of acres, and occupies about one-fifth of the whole area of the Colony. No river runs through it, and the places marked as lakes are often dry. There are sand-hills some of which rise as high as 250 feet. These are called "Pine Rises," as sometimes a few specimens of Murray pine trees grow upon them. Otherwise the country is occupied by the Mallee Scrub, which is summarily called the *Eucalyptus dumosa*, although other species, as the *E. oleosa* and *E. socialis*, are also found. The average height of the trees is about 12 feet, while the maximum is 25. The monotony of such a country is as bewildering as an expanse of open ocean. This was a suitable region for the cultivation of a knowledge of the stars. The mechanical grouping which we have considered accords well with the circumstances of the people. Mr. Stanbridge mentions that they claimed to be better acquainted with the stars than any other tribe. The materials preserved, which we have been investigating, seem pretty fairly to establish this claim.

European and Asiatic words for *eagle*, *hawk*, &c.(1.) With stem letters of *Aquila*.

<i>Aquila</i>	Q L	eagle, Latin.
<i>Aguila</i>	G L	eagle, Spanish.
<i>Aigle</i>	G L	eagle, French.
<i>Eagle</i>	G L	eagle, English.

(2.) Dropping the initial guttural.

(Aq-)uila		
Wali	W L	eagle, Malay, &c.

Australian words for *eagle*.(1.) With same stem letters as *Aquila*.

<i>Agal-eg</i>	G L	eagle, Cape York.
<i>Gooal-anghta</i> ...	G L	eagle, Tasmania.
<i>Couel</i>	C L	eagle, Wilson River, N.S.W.
<i>Kawool</i>	K L	eagle, Manning River, N.S.W.
<i>Coola-patamba</i>	C L	"where the eagle drinks," Mount Cairncross, N.S.W.
<i>Klu-roong</i>	K L	hawk, Victoria.
<i>Keel-gur</i>	K L	hawk, Western Australia.
<i>Pun-gyl</i>	G L	eagle, Victoria.
<i>Pittie-kil-kadie</i>	K L	hawk, South Australia.

(2.) Dropping the initial guttural.

(Ka-)wool		
<i>Ual-ce</i> }	U L	eagle, Western Australia.
<i>Ual-cia</i> }		
<i>Wil-lo</i>	W L	eagle, Adelaide.
<i>Wil-to</i>	W L	star, eagle, Adelaide.
<i>Wil-tutti</i>	W L	season of year, Adelaide.
<i>Wil-lutti</i>	W L	spring, Adelaide.
<i>Weel-aty</i>	W L	eagle, Tasmania.
<i>Wol-jar</i>	W L	vulture, Western Australia.
<i>Bil-yarra</i>	B L	eagle, Darling River.
<i>Dib-bil</i>	B L	eagle, Brisbane River.
<i>Wer-bill</i>	B L	eagle, Murray River.
<i>Pul-tyak</i>	P L	eagle, Manning River.
<i>Pul-onga</i>	P L	hawk, Kamilaroi.
<i>Pirr-pil</i>	P L	eagle, West of Victoria.
<i>War-pil</i>	P L	eagle, Richardson River, Victoria.
<i>Waa-pil</i>	P L	eagle, Loddon River, Victoria.
<i>Mil-kieworie</i>	M L	hawk, South Australia.
<i>Mul-urah</i>	M L	hawk, Western Australia.
<i>Mal-yal</i>	M L	eagle, New South Wales.
<i>Mul-lion</i>	M L	eagle, Kamilaroi.
<i>Mul-len</i>	M L	eagle, Wagga Wagga, N.S.W.
<i>Mul-len</i> }	M L	hawk, Victoria.
<i>Mul-len</i> }		
<i>Jam-mul</i> }	M L	hawk, Port Jackson.
<i>Jam-mul</i> }		

The authorities for the foregoing Australian words are:—Collins, Breton (Lieut.), Mitchell (Sir T. L.), Stokes (Capt.), Teichelmann and Schürmann (Revs.), Grey (Sir G.), Salvado (Bishop), M'Gillivray, Milligan, Ridley (Rev.), R. Brough Smyth, and Dawson, together with some manuscript vocabularies.

The Spectrum and Appearance of the recent Comet.

By H. C. RUSSELL, B.A., F.R.A.S.

[Read before the Royal Society of N.S.W., 6 July, 1881.]

I SAW the comet first on the evening of May 25th. It was then a conspicuous object with the naked eye, and with the aid of a binocular glass I traced the tail twelve degrees. With the 11½-inch refractor the nucleus was very well defined; it appeared a little oval in shape, the longer axis being coincident with the direction of the tail. There was a slight coma in front of it. The diameter of the nucleus was four seconds of arc.

From May 25th to June 2nd cloudy weather prevented observations, except just a glimpse on the 2nd, when I saw it between the clouds. The coma had very much increased in front of the nucleus. The morning of June 5th was fine, a still greater increase in the coma was visible, the greater part of it in front of the nucleus, but a large shoot or tail-like part extended from the following side and then turned to the tail. (See Drawing A.) The evening of the 5th was also fine, and as I looked at the comet it passed over a small star, ninth magnitude, some of the brighter parts of the coma going over it without stopping any of its light, so far as I could see. This star with others in the tail are shown in Drawing B. At 6h. 15m. 5s. p.m., S.M.T., the star and comet had the same declination, and the distance from centre to centre, measured with the filar micrometer, was only twenty-one seconds of arc. At the same time three very small stars were shining through the tail with no apparent loss of light. Drawing B was made at this time, and a good set of measures with another small star was obtained. It was remarkable the change in the coma which seemed to have taken place since the morning, but from its subsequent appearance I think it must have been our atmosphere that prevented me from seeing as much of the coma in the evening of the 5th as I did in the morning.

On the morning of June 6th I obtained a good set of measures of the comet and a seven magnitude star, and on the evening of the same day, there being no good star for observation, I determined to test the comet with the spectroscope; but before doing so drawing C was made, to show the rapid change that was going on in the coma. This was the only time that there seemed to be any dark shadow behind the nucleus, and I may mention that the