A PLEA FOR THE REFLECTING TELESCOPE

By G. Parry Jenkins

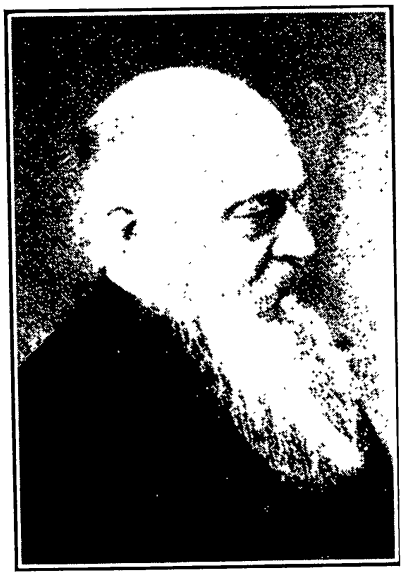
I HAVE taken upon myself the responsibility to-night of making a plea for the reflector because I am addressing a Society whose members are composed primarily of amateur astronomers, to whom the possession of a good telescope with which to study the wonders of the heavens is an actual necessity. I well know that a great difference of opinion exists in the minds of observers as to the relative merits of the two classes of instruments in common use, viz.:—Refractors and Reflectors; and having had personal experience extending over a number of years with both kinds, you will, I am sure, bear with me when I attempt to lay before you some of the peculiar advantages of the latter, together with reasons for this choice.

Last year we celebrated the tercentenary of the invention of the telescope with which Galileo observed the heavens, but as I need hardly point out that was the refractor constructed in 1609, for the reflector did not come on the scene until over fifty years later. Its appearance was due to the conviction in those days that opticians had reached the limit of their skill in the production of telescopic objectives, which at their best were all non-achromatic and whose color aberrations interfered so materially with good seeing.

It is interesting to note, in passing, the various attempts the old astronomers made to overcome this serious defect in their telescopes, but without success, the reason being that every lens is in reality a collection of prisms, and a prism shews everything bordered with rainbow hues.

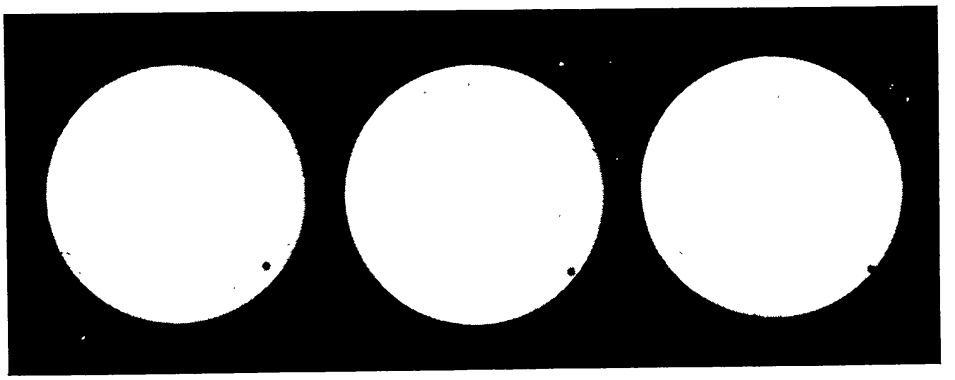
The physicists of to-day, armed with the spectroscope, owe all the knowledge they possess of the heavenly bodies to this property which a triangular piece of glass possesses of splitting up a beam of light into prismatic colors, but the early observers

PLATE IV.



REV. T. W. WEBB, M.A.

GEORGE H. WITH, F.R.A.S.



2.45 2.30 2.15 p.m.

PHOTOGRAPHS OF THE TRANSIT OF VENUS,

December 6, 1882, taken by Samuel Cooper, of Charminster, Dorsetshire, with a 9-inch Reflector.

with the telescope tried every means in their power to get rid of this same fringe of color, as they were concerned only with visual observations.

With this purpose in view the definition of the primitive glasses was partially improved by increasing their focal length and, consequently, enlarging the image, while the color fringe of the objects viewed remained of about the same breadth. On this account these early telescopes grew apace until we find them measuring 100 feet in length. One was actually constructed 600 feet long but it proved too unwieldy to be utilized. In the hands of such men as Hevelius, Huyghens and Cassini many important discoveries were made, however, with these imperfect and very cumbersome instruments.

At this time the immortal Newton tackled the color problem of the refractor. It is true he also failed to correct it. Accordingly he turned his attention to some other way of solving the problem, and accomplished it by devising a new mode of telescope, called the reflector, which shewed objects in their true light, and eliminated all the tantalizing prismatic colors that had so perplexed the old observers. So the Newtonian reflector first appeared in the year 1668. In Sir Isaac Newton's hands it was only a few inches long, but to-day some of the leading telescopes of the world are built upon this principle. In this case the image is formed by reflection from a concave mirror and not by transmission through an object glass as with the Refractor. The image thus formed is then magnified by the eye-piece in the ordinary way.

The four leading forms of reflecting telescopes are known respectively as:—

The Gregorian, after Dr. James Gregory, who actually constructed this particular kind in 1663.

The Newtonian, after Sir Isaac Newton, who devised it.

The Cassegrainian, after the well known Frenchman, Cassegrain, who invented it in 1672.

And the Herschelian, after Sir William Herschel, who so successfully adopted this special kind of instrument although he

was not the inventor of this type. This honor belongs to LeMaire, who first constructed it in 1728.

In the survival of the fittest, which is true in the realm of telescopes as well as other spheres, the Newtonian is the most popular reflector of the various kinds in use at the present time, and it is this class of reflectors I wish more particularly to draw your attention to this evening.

Let me, however, in the first place trace briefly the history of the reflector as it was being developed in the hands of some of its most enthusiastic advocates, and see some of the marvellous results that were achieved by its users to garnish the store of astronomical knowledge which is ever increasing as age after age rolls on. Here, again, we find that the amateur has worthily filled his place side by side with the professional astronomer and that each by his unswerving devotion to the science we cultivate in common deserves our meed of praise.

Every mirror that was used in the construction of these telescopes, previous to fifty years ago, was composed of a copper alloy (usually 126 parts of copper to 59 of tin) called speculum metal. It followed as a natural consequence that the surface, despite every care and attention, would sooner or later corrode after coming in contact with the night air. On this account the figure was in constant danger of being spoilt, when its surface had to be repolished ; and as the parabolic curve was difficult to attain at all times, it thus happened that when once the mirror deteriorated it often became a tedious and hard task to bring it back to its original defining quality. As we can readily understand, this was one of the most serious drawbacks to the permanency of such an instrument, but nothing seemed to daunt the efforts of the pioneers of observational astronomy.

It was in 1774 that a young musician named William Herschel, then residing at Bath, made a 5-inch reflecting telescope, and how little the world of astronomy realized the star of first magnitude that had arisen on the horizon by this event ! Henceforth the progress of the reflector was by leaps and bounds. Herschel made about 200 mirrors himself, his greatest effort cul-

minating in the famous 4-foot reflector with which he discovered two satellites of Saturn, and made many other epoch-making discoveries.

The telescope with which Sir William Herschel discovered the planet Uranus in 1781 was of 6 inches aperture only, and I remember, as a boy, looking at it with admiration in South Kensington Museum.

In 1845 Lord Rosse completed his 6-foot reflector at Parsonstown, and the confines of the known universe were indefinitely enlarged thereby. As regards size, this monster telescope is still unsurpassed. The tube is 56 feet long, 7 feet wide and the great metallic mirror alone weighs 4 tons.

The celebrated optician Steinheil, in Germany, first hit upon the idea, in the year 1856, of utilizing glass instead of metal as hitherto for telescopic mirrors, and the following year Léon Foucault, in France, independently made the same suggestion. Henceforth the silver-on-glass reflector came to stay.

In the early sixties George Henry With, a schoolmaster in Hereford, turned his attention to making these new telescopes. His work was soon brought into notice by the Rev. T. W. Webb, the well-known astronomer, who lived in the same county, and had marked his progress from the start with much satisfaction.

In November, 1865, we find the Rev. Mr. Webb writing regarding this pioneer as follows:—"Mr. With is going on admirably with his specula. Those of 6½ inches and 5½ foot focus have, I hear, most marvellous definition. He has just sold a splendid thing of 10⅛ inches, the performance of which greatly delighted me."

The Rev. T. W. Webb's venerable father now presented his son with one of With's 9⅓-inch mirrors, and the grand work performed with it is recorded in many a page of "Celestial Objects."

These "With" mirrors then became world-famous, and observers of the greatest reputation often chose them in preference to the refractor.

Nathaniel E. Green used one of 13 inches aperture in his

classic study of Mars at Madeira in 1877, and afterwards an 18 inch in his observations of the belts and markings of Jupiter. This latter is described by Mr. Green in Vol. xlix., Part 2, of the *Memoirs* of the Royal Astronomical Society for 1887-89 as "a superb mirror figured by George With of Hereford."

Residing, as I did, for ten years in the city of Hereford I numbered Mr. With as one of my closest friends, and many a time have watched him grind his mirrors. How delicate and tedious an operation it was can readily be inferred from the fact that a deviation of only one thousand part of an inch from the true parabolic curve would spoil the mirror.

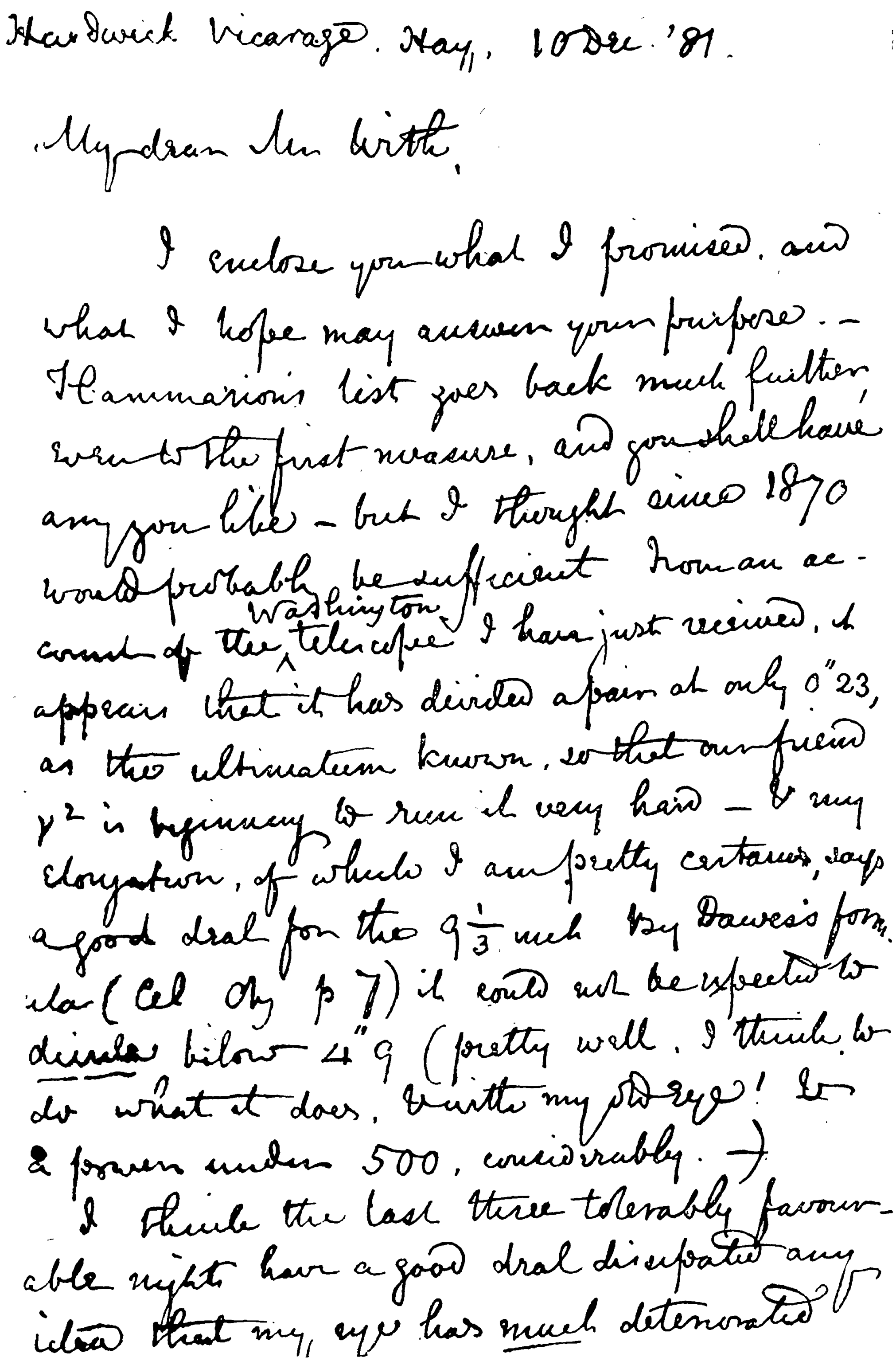
In reference to the Rev. T. W. Webb's appreciation of the reflectors turned out by G. H. With the following unpublished letter in my possession, reproduced on pages 64-66, is most interesting.

In comparing refractors and reflectors the principal reasons of the preference for the latter amongst amateur astronomers in particular may, I think, be summed up as follows: — Absolute achromatism; the visual and actinic rays being brought to the same focus, this instrument is equally good for photography as for observing; the horizontal view of all objects looked at; and the price only a fraction of a refractor of same size.

Prebendary Webb, the author of "Celestial Objects for Common Telescopes," whose qualifications to speak with authority on this subject, no one will question, states in the above work :—

"An achromatic, notwithstanding the derivation of the name, will show color under high powers where there is much contrast of light and darkness. Reflectors are delightfully exempt from this defect; and as now made with specula of silvered glass, well deserve, from their comparative cheapness, combined with admirable defining power, to regain much of the preference which has of late years been accorded to achromatics."

In the *English Mechanic and World of Science*, for June 20, 1879, W. S. Franks, the well-known observer, gives a very careful comparison between an achromatic refractor and a reflector side by side, and concludes that the light of a 6½-inch silvered



Hardwick Vicarage. Hay, 10 Dec '81.

My dear Mr With,

I enclose you what I promised, and what I hope may answer your purpose. — Flammarion's list goes back much further, even to the first measure, and you shall have any you like — but I thought since 1870 would probably be sufficient. From an account of the Washington telescope I have just received, it appears that it has divided a pair at only 0″23, as the ultimatum known, so that our friend γ^2 is beginning to run it very hard — & my elongation, of which I am pretty certain, says a good deal for the 9⅓ inch. By Dawes's formula (Cel Obj p 7) it could not be expected to divide below ·4″9 (pretty well, I think, to do what it does, with my old eye! & a power under 500, considerably.)

I think the last three tolerably favourable nights have a good deal dissipated any idea that my eye has much deteriorated

FACSIMILE OF LETTER WRITTEN BY T. W. WEBB TO G. H. WITH, (1881). [*Continued on next two pages.*]

I have seen things so very much better than for months previously that it is evident how much atmosphere has to do with it. On Wednesday & Thursday I suspected Encke's division. & saw the gauze ring very faintly. And Jupiter has a much sharper limb. Mars ♄ is sharp enough. but details so feeble. I do not know which may be in fault there.

Mrs Betale talks about not going beyond £30 without authority of Council. Either on the supposition of the sale of them procure a-chromatic - a small (± 3 inch) but very good one - for £12 to 18. - Which I think they will not get readily. 'Tis a queerish old tripod, too. — So I fancy these ideas stand over. —

I must close, with kindest regard.

Yours most sincerely

T. W. Webb

γ^2 Andromedæ —

(from Flammarion's Catalogue)

1870·18	— 0″·64	— OΣ.
— 71·01	— 0″·61	— Dunèr.
— 71·24	— 0″·50	— Dembowski
— 72·19	— 0″·60	— OΣ.
— 72·90	— 0″·61	— Brunnow.
— 73·17	— 0″·67	— OΣ.
— 73·81	— 0″·50	— Wilson & Seabroke
— 73·94	— 0″·46	< Glenhill
— 74·93	— 0″·56	— Glenhill
— 75·14	— 0″·62	— OΣ.
— 77·05	— 0″·48	— Schiaparelli
— 77·11	— 0″·38	— Hall.

(from Washington Obss with 26 inch Prof. Hall — power 888.

1877·104	— 0″·35	
— 109	— 0″·38	
— 112	— 0″·37	
— 115	— 0″·37	
— 117	— 0″·43	
1880·037	— 0″·33	
— 039	— 0″·35	
— 045	— 0″·28	

speculum is equivalent to that of a 5-inch object glass. I formerly owned the fine 5-inch refractor by W. Wray with which this instructive comparison was made,

The introduction of the silver-on-glass mirrors came as a boon and a blessing to many of those who, in Miss Caroline Herschel's language, "minded the heavens," but had hitherto been unable to gratify the natural wish to own a telescope.

If I am here found to be personal and reminiscent you will have to forgive me as it has been my privilege to know quite a number of observers in different stations in life who used the reflector, and from it derived their greatest pleasure and intellectual profit.

Astronomers in humble life have been many, and the harder the way to reach the stars the more determined appeared the aspirants to knowledge in almost every instance.

I will lay before you a case or two in point.

In the quaint old village of Charminster, in the south of England, lived a bricklayer by trade named Samuel Cooper. Of a contemplative and enquiring turn of mind, astronomy and its marvels appealed strongly to him from youth upwards. After studying the various popular books on the subject he could lay his hands upon, he determined at last to make himself a telescope. He succeeded so well that he became quite an expert on the construction of such instruments, and under the *nom de plume* of "The optical Bricklayer" enriched many a page of *The English Mechanic* with his self-acquired knowledge on telescope making.

In the early eighties I visited this worthy old astronomer in his little thatched cottage in Dorsetshire, and saw his 9-inch reflector with which he photographed the Transit of Venus, on December 6, 1882. Clouds interfered with many of the elaborate preparations that had been made all over England to witness this rare event, but at 2.15, 2.30 and 2.45 p.m. Samuel Cooper had the intense satisfaction of seeing and photographing the phenomenon which so many missed. (Plate IV.) He very kindly presented me with the original negatives, and as no member of the Royal Astronomical Society of Canada can possibly expect

to have the chance of taking such a photograph until the 7th of June, in the year 2004, I have decided to hand over these precious negatives, for safe keeping, to our Society. By the way a namesake of mine, Henry Jenkins, lived to the ripe old age of 169 years, and, as you know, this is authenticated, but for anybody to be obliged to wait 94 years hence for another opportunity of photographing the transit of Venus is, to say the least of it, like "Hope deferred, maketh the heart sick."

Another astronomical genius was born in the fair Isle of Anglesey, in 1818, not far from the historic spot where the Roman General Suetonius massacred the Druids of old. He bore the very ordinary name of John Jones, and was brought up as a farm laborer. If compulsory education had been in vogue in Great Britain in those days I have not the slightest doubt John Jones would have been occupying a professor's chair in one of our leading universities. As it was, his thirst for learning was baffled at every turn, but still he triumphed.

Dr. Samuel Smiles, of "Self-Help" fame, makes use of this very personage in his work entitled "Men of Invention and Industry," published in 1884, to show what perseverence can attain when the soul is aflame after knowledge and a telescope, and pays a glowing tribute to his accomplishments.

I had the honor of knowing John Jones intimately as I once lived in the Island of Anglesey, and many were the pleasant evenings we spent together in my own observatory and afterwards at his home looking through his great $8\,^{3}/_{16}$-inch reflector made by his own hands, and which he familiarly called "Jumbo." He told me that after receiving only twelve months' schooling he hired to a farmer. Being a Welshman, to acquire the English tongue was just like learning a new language to him, and this he accomplished almost entirely from books. After working some years with the farmers, he was employed by an itinerant Methodist minister, and when he had saddled his master's horse on Sundays he used to secrete himself in the library of the old divine and there, as it were, acquired by stealth his first knowledge of astronomy, for amongst his master's treasures was a

Welsh book on astronomy, being Dr. Thomas Dick's "The Solar System," translated into Welsh by Eleazer Roberts, of Liverpool. The lure of the skies held him spell-bound ever afterwards.

When about thirty years old illness overtook him, and he removed to Bangor, the centre of the great Welsh slate industry. He was employed at twelve shillings a week in counting slates or loading the ships in the harbor with the same. He now learnt navigation and mensuration from one who kept school for young sailors. The perusal of Sir John Herschel's "Outlines of Astronomy" and of his "Treatise on the Telescope" about this time set his mind on fire as he said. He conceived the idea of making a telescope, for he could not afford to buy one. His first attempt was one thirty-six inches in length, the tube being made of cardboard, and the glasses costing four shillings and sixpence only. With this he could see Jupiter's four moons. the lunar craters and a few double stars. He was delighted, but longed for a more powerful instrument. It was now he also began to study Greek, a friend having bought him a Greek Testament and a Greek Lexicon.

In the year 1868 he commenced the task of making a reflecting telescope, having, out of his scant earnings, bought a rough piece of glass from St. Helens, of 10 inches diameter. Now came the grinding and polishing to a spherical curve, all of which he did without a lathe by his own hands with the aid of emery and rouge. The mirror was then parabolized and silvered by George Calver. John Jones then mounted it in a wooden tube and stand all made by himself and its performance turned out to be very satisfactory. I well remember him telling me with what glee he had first seen the snow-cap on Mars through this instrument.

I also noticed amongst his treasures an equatorial head on a firm tripod stand constructed entirely by him. The declination and right ascension circles of this equatorial were unique. It is not too much to say, I believe, that they are the only examples of

the kind extant. They were constructed of slate and divided with mathematical accuracy into degrees and minutes.

John Jones also made a good 6-inch reflecting telescope, together with a spectroscope. In later years he could read the Hebrew Bible, and had achieved some fame as a local poet.

It was a singular pleasure for me to propose him as a member of the Astronomical Society of Wales, in 1895 — he was then 77 years old—and in the fourth number of the *Journal* of that Society I have contributed a sketch of his life.

So in counting slates by day and counting the stars at night this grand old man passed away in 1898, at 80 years of age, an inspiration to others (friendless and unaided as he was) to patiently surmount every difficulty in the attainment of one's desires.

In direct contrast to the two previous examples of "astronomy under difficulties," let me now dwell for a few moments on the career of one who was in affluent circumstances when he devoted his whole time and talents to the pursuit of the science. In this instance it was a case of the very best outfit that money could buy to further the cause of original research in the field of celestial photography. Isaac Roberts, of Maghull, Liverpool, procured a reflecting telescope of 20 inches aperture, in 1885, from the famous workshops of Sir Howard Grubb, of Dublin. Soon afterwards this instrument was mounted on the summit of Crowborough Hill, Sussex, and photograph after photograph of nebulæ, clusters and star groups were obtained, many of which have remained unequalled to this day. Two magnificent volumes, containing a selection of these photographs, were published in 1893 and 1900, and will remain a lasting memorial to the labors of this distinguished astronomer. I well remember the astonishment which his photograph of the great Andromeda Nebula (taken on October 10th, 1887) created amongst all observers of this well-known object. G. P. Bond, with the 15-inch refractor of the Harvard Observatory, had long ago noted two dark bands, or lanes as they were called in the nebula. I had often succeeded in seeing these same markings with my 8½-inch "With" re-

flector, and I considered the fact spoke well of the performance of my own telescope. To me this also exemplified Sir William Herschel's oft-quoted remark that a less optical power will show an object than was required to discover it.

When Roberts' photograph was exhibited it revealed for the first time the real structure of the great nebula. The dark bands referred to by Bond were found to be divisions between symmetrical rings of nebulous matter surrounding the nucleus according to Dr. Roberts own words, and thus the spiral character of this nebula was proved beyond doubt. A few days after this remarkable photograph was taken (just over 23 years ago) a copy was sent by Dr. Roberts to Professor Charles Pritchard, then Savilian Professor of Astronomy in the University of Oxford, who in turn sent it to G. H. With, of Hereford, in whose hands I saw it the day of its arrival. Mr. With had constructed a 15-inch reflector for Professor Pritchard, who was very proud of the mirror, but in referring to the photograph just taken by Roberts and the stars involved in the nebulosity he wrote, I remember, — "No amount of gazing through my 15-inch will reveal the stars easily seen on the photograph. The reason must be that the impressions received by the retina are only transient, while on the photographic plate they are cumulative,"

It has never been made public, as far as I know, that W. S. Franks was the assistant photographer on Crowborough Hill, but posterity will, no doubt, yet give him credit as being Dr. Roberts' worthy coadjuter.

In an able article on "The Tercentenary of the Telescope," in the *Edinburgh Review* of January last, the writer, referring to Dr. Isaac Roberts' achievements, most appropriately says :—

> "Mature judgment finds in his work two qualities altogether admirable — he pursued the less showy and more difficult objects which offer few attractions to the picture-maker, so that now, years after the two volumes were published, we may find in them photographs of things which are unobtainable elsewhere; and secondly, he gave with each photograph a precise statement of its orientation, the scale upon which it was reproduced, and the identification and position of selected stars appearing in it; obvious things to do, one might say, were it not that they are curiously rare, and the last unique."

I consider Samuel Johnson's dictum applies with special force to the observational astronomer — "He that enlarges his curiosity after the works of nature, demonstrably multiplies his inlets into happiness." Those who could endorse this saying as the result of using the reflector are many, and their names must recur to your minds as readily as to my own. The following and their instruments have become famous.

A. Stanley Williams, of Brighton, 6½-inch Reflector.

T. Gwyn Elger, of Bedford, 8½-inch Reflector.

W. F. Denning, of Bristol, 10¼-inch Reflector.

Edwin Holmes, of Hornsey Rise, 12¼-inch Reflector.

Scores of others might be mentioned.

I will, therefore, only refer to another instance or two that have come under my immediate notice.

Arthur Mee, the well known author of "Observational Astronomy," published in 1893, and other works, has constantly used for over 20 years an 8½-inch "Calver" reflector, and is as satisfied to-day with its defining power as when he purchased it. His drawings of the sun, moon and planets have frequently appeared in the *Journal* of the British Astronomical Association and other periodicals, and are excellent. The one of Jupiter from his pencil, which I submit for inspection, will bear out my statement.

No man has done more towards popularizing astronomy in the principality of Wales than Arthur Mee. He founded the Welsh Astronomical Society in 1894 and was its first president. From the commencement Mr. Mee has edited its *Journal*, and I am glad our Society continues to exchange publications with the sister society in gallant little Wales.

One of the most accomplished draughtsmen of the present day in delineating planetary details is Scriven Bolton, of Leeds. His "Note (illustrated with a plate) on the General Aspect of the Principal Markings on the Planet Jupiter during the Apparition of 1907-8," formed a feature of No. 3 of Vol. lxx., of the *Monthly Notices* of the Royal Astronomical Society published in January last. Mr. Bolton employs two Newtonian reflectors,

one by Calver of 18¼ inches aperture, and the other a With-Browning of 10¼ inches aperture.

I was fortunate in being presented, by this observer, with four beautiful lantern slides of some of his drawings of Jupiter and Saturn, colored by his own hand. At the close it will afford me pleasure in showing them to you. The one of the planet Saturn, taken on January 31st, 1909, received the gold medal at the Recent Franco-British Exhibition in London.

In America the reflector was condemned before it had been given a trial, but the proof of the pudding is in the eating you know.

With Christmas only a few days ahead of us I make use of this simile advisedly as at another time its truth might not come so near home to us.

About the year 1858 Henry Draper paid a visit to Lord Rosse, in Ireland, and saw the mighty reflector of Parsonstown. It can be said of him like Cæsar of old—"He came, he saw, he conquered." On his return to America Draper constructed a 15-inch reflector with which he produced a magnificent photograph of the moon four feet in diameter.

In 1865 followed a work that was published by the Smithsonian Institution and remained a standard on the subject for a number of years, viz.:—"Construction of Reflectors," by Henry Draper.

By 1871 Dr. Draper had erected a 28-inch silver-on-glass reflector, which was the largest in America at that time, and is to-day still in use at Harvard University.

A year later (1872) the first star whose spectrum was successfully photographed was Vega, by Henry Draper. Truly a wonderful achievement. In another sense it was the day of small things, but therein was laid the beginning of the great "Draper Catalogue of Stellar Spectra," published in 1900, and including the composition of over 10,000 stars.

In England the art of speculum grinding has, undoubtedly, reached its highest level in the hands of the famous maker George Calver, of Chelmsford, whose work is still unsurpassed.

About fifteen years ago a three-foot reflecting telescope belonging to the late Edward Crossley, M.P., Halifax, Yorkshire, and made by Calver, was presented to the Lick Observatory. On Professor J. E. Keeler becoming director of that institution in 1898 he immediately undertook, as his personal task, the photographing of the brighter nebulæ and star clusters with this instrument. His untimely death prevented, to a certain extent, the consummation of this project, but Vol. VIII. of the *Publications* of the Lick Observatory, published two years ago (and which can be examined in the Library of our Society) contains 68 specimens of celestial objects secured by this telescope. Nothing more beautiful in this line has probably ever been published.

Professor Keeler's own opinion of this reflector is worth quoting as taken from the *Astrophysical Journal* of June, 1900. "The mirror, the most important part of the telescope, has an aperture of three feet, and a focal length of 17 feet 6·1 inches. It was made by Mr. Calver. Its figure is excellent. According to the Foucault test, the illumination of the mirror is very uniform, while star discs, as seen in an ordinary eye-piece, are small and almost perfectly round."

One of the largest silver-on-glass telescopes in existence is the late Dr. A. A. Common's renowned 60-inch reflector built in 1889, and at present forming a part of the astronomical equipment of Harvard Observatory, to which it was transferred in 1904.

Dr. Common, of Ealing, usually gets the credit of figuring the speculum of this magnificent instrument, which has been used so effectively in celestial photography and measuring the light of very faint stars, but as a matter of fact (as pointed out by Arthur Mee in his "Story of the Telescope," published last year) it was Albert Taylor, Dr. Common's assistant, an amateur astronomer of great ability, and now one of His Majesty's Welsh Inspectors of Schools, who actually made the great mirror, — so honor to whom honor is due.

Almost the last word on my subject must be the bare men-

tion of G. W. Ritchey's elaborate work "The Modern Reflecting Telescope," published in 1904. If time allowed I might dwell upon the remarkable productions of Professor Ritchey, who makes, mounts and observes with his own telescopes — the largest being a 60-inch reflector, although a 100-inch is in contemplation — at the Solar Observatory of the Carnegie Institution at Mount Wilson and Pasadena, but Professor Chant, who was a delegate at the Conference of the Solar Union on Mount Wilson, this year, has very graphically given us an insight into what is being accomplished there, in our last September-October JOURNAL.

Here I must stop. The array of facts which I have laid before you of the success of the reflector in the hands of those who have made it their working tool, will I hope justify my plea for its continued use amongst astronomers, and more especially the ordinary members of astronomical societies such as ours.