

*The 250th Anniversary of the Foundation of the
Royal Observatory, Greenwich.*

(See Plate, facing p. 273.)

IMMEDIATELY after the meeting of the International Astronomical Union at Cambridge, the 250th anniversary of the Royal Observatory at Greenwich was celebrated. The celebrations covered two days, July 23 and 24. On the first day there was a garden-party at the Observatory, followed by a *conversazione* at the Royal Society, which the members of the International Astronomical Union also attended. On the second day there was a luncheon at the Savoy Hotel, provided by the Government Hospitality Committee.

At the Garden Party Their Majesties the King and Queen graciously attended, and spent an hour and a half examining the instruments, under the guidance of the Astronomer Royal and Lady Dyson. Before the arrival of the royal party a large crowd gathered along the main avenue from Blackheath and just outside the Observatory itself, the route was lined by over a thousand boys from the Royal Hospital School. On arrival of Their Majesties the Band of the Royal Hospital School played the National Anthem and the Royal Standard was hoisted. The King and Queen were received by the Astronomer Royal and Lady Dyson, and with them were the First Lord of the Admiralty and the Mayor of Greenwich. In the Octagon Room, the members of the Board of Visitors were presented by Sir Charles Sherrington, President of the Royal Society and Chairman of the Board, while the Astronomer Royal presented a few representative astronomers. A photograph showing the King and the Astronomer Royal, followed by the Queen and Lady Dyson and other members of the royal party, is published in this number. About 400 visitors were at the garden-party. Half of these were foreign astronomers with their ladies, while the other half represented British astronomy. Over 20 countries were represented.

In the evening the Royal Society gave a *conversazione* in honour of the anniversary, and also a welcome to the foreign astronomers who had come over to England for the meeting of the International Astronomical Union. The guests were received by the President of the Society and Lady Sherrington, and spent the evening in a very pleasant way—in conversation and in examining various exhibits, including the earliest reflecting telescope made by Newton with his own hands.

On July 24 at the Luncheon the First Lord of the Admiralty (*The Rt. Hon. W. C. Bridgeman*) presided. In giving the toast of the Royal Observatory, he said that in 1886 two young and innocent men appeared before the examiners of Trinity College, Cambridge, in competition for scholarships at that college. One was a modern-sider and the other a classical-sider. The present Astronomer Royal was one of the modern scientific competitors, and was, of course, successful, while he (Mr. Bridgeman) was one

of the classical competitors, and was successful too. The contrast was not quite perfect at this point. He had only to draw a parallel between their careers. From that moment the Astronomer Royal began to mount *sic itur ad astra*, and he (the speaker) began to descend. He descended until that morning, which he had spent in investigating the bowels of the Earth in company with the mine-owners and miners, who, as might possibly be known, were not quite agreed on certain matters at that moment. He could only hope it would not put off other classical aspirants from trying again to get honours in classics, because of a feeling that all the jam went to the scientific side. He ought to congratulate the Astronomer Royal on some of his latest triumphs—in particular, in securing the gold medal of the Royal Astronomical Society. For his own part he might get a chunk of coal at his head.

Continuing, Mr. Bridgeman said that he was not sure that the toast ought not to be to the pious memory of Charles II., who never got the credit which was his due. It was entirely owing to his intelligence and energy that the Greenwich Observatory was founded. The Navy owed him a great deal. He was an admirer of the Navy (although in his reign we were not so successful as we were now), and asked for money for cruisers and other up-to-date vessels of the time. But in those days the people were not quite sure that the money, if provided, would be spent altogether in the way they desired. Charles II. was a great benefactor when he started the Observatory. People should put it to his credit and stand up for him against some of those who were inclined to condemn him for other characteristics he possessed.

The work of the Observatory was to keep time in its proper place. The ordinary individual citizen was apt to say with Shakespeare that "times are out of joint, oh! cursed spite that ever I was born to set it right." The Astronomer Royal said "times are out of joint, are they? I will put it right in a minute"—and he did. They in the Navy were very grateful to him for keeping their chronometers correct and enabling them to be as punctual as any other Service of His Majesty. The odd thing was that Father Time did not seem to mind being ordered about by Greenwich Observatory. He was told that in 250 years there had only been nine Astronomers Royal. Compare that with the Admiralty, and it would be found that there had been 14 First Lords in the last 15 or 20 years. From that he deduced that time liked being kept in its place, and the reason was that Greenwich Observatory was managed by such admirable men as his friend the Astronomer Royal. He coupled with the toast the name of Sir Charles Sherrington, President of the Royal Society, which was also founded by Charles II.

Sir Charles Sherrington said that the anniversary was of interest not only to the Observatory, but to science generally. Owing to its conspicuous achievements and its splendid record of service to science, the Royal Observatory was a source of inspiration

for the present and the future. The Royal Society cherished no connection more than its tie with the Observatory. All the Astronomers Royal without exception had been Fellows of the Royal Society and had served on its Council. Referring to the association of the Royal Society with the Navy, Sir Charles said that Pepys, the Secretary of the Admiralty, was President of the Royal Society. It was a pity that the Diary concluded just before the Observatory was founded, owing to Pepys's failing sight. Had he gone on, what a revealing document would have been left for posterity! The science which was the basis of the art of navigation would remain one of the chief duties of Greenwich. We were a maritime nation, and therefore the work at the Observatory was of the deepest interest to us. He felt sure it would continue to take its share in bringing to the utmost perfection that national art.

Sir Frank Dyson, the Astronomer Royal, in proposing "Our Guests," said that the oldest existing observatory in Europe was at the Vatican. It was founded by Pope Gregory XIII., who instituted the Gregorian calendar. After that came Leyden in 1632, Copenhagen in 1637, Paris in 1667, and Greenwich in 1675. There was then a gap. In the latter half of the 18th century came Prague, Geneva, Milan, Oxford, Rome, San Fernando, Madrid, and Coimbra. In 1820 two observatories in which England had particular interest were brought into being—Cambridge and the Cape of Good Hope. They were the only observatories which had passed their centenary. Later came the American observatories, which sprang up with surprising rapidity, and commenced in 1840 with Harvard and Philadelphia, followed by many others, which had contributed so largely to the progress of astronomy. Victoria, in Canada, was opened in 1917. The last observatory of all, due to the enthusiasm of Prof. Schlesinger and the public spirit of Yale University, was started only this year at Johannesburg, and was opened by the Prince of Wales hardly six weeks ago. All rejoiced at their success. Fortunately, Astronomy was a subject in which no material interests were involved, and so their competition with one another was entirely of a friendly character. All liked to do things before the other, but each rejoiced at the other's success.

For the guests Prof. Baillaud, Director of the Paris Observatory, Prof. W. W. Campbell, President of the University of California and Director of the Lick Observatory, and Prof. H. H. Turner of Oxford replied as follows:—

M. Baillaud. Il m'est particulièrement agréable d'avoir l'occasion de remercier le gouvernement Britannique d'avoir bien voulu nous recevoir d'une façon si large et si cordiale. Notre séjour à Cambridge fut des plus charmants. Tout nous y rappelait les plus grands noms de la science anglaise et, tout d'abord celui de Newton, le plus profond esprit peut-être qui dans tous les temps se soit rencontré dans l'humanité. Tout contribuait à élever nos

âmes au-dessus des contingences de la vie pratique, rendait ainsi nos délibérations plus faciles, et nous aidait à prendre les décisions les plus utiles, les plus nobles, les plus sûres.

Et aujourd'hui nous sommes réunis ici, après avoir assisté hier à la visite de l'Observatoire Royal, à la suite de leurs Majestés le Roi et la Reine qui donnaient ainsi la plus haute marque de confiance à la Science, aux savants réunis, en même temps qu'aux astronomes de Greenwich, et particulièrement à l'illustre Astronome Royal, Sir Frank Dyson, si cordialement estimé, admiré et respecté de tous. Directeur de l'Observatoire de Paris, je ne saurais me dispenser d'insister sur le développement et les progrès de l'Observatoire de Greenwich dont le rôle a été si important depuis sa fondation, et ne cesse de grandir encore.

C'était bien à un peuple de navigateurs qu'il appartenait de créer un observatoire avec ce programme tracé par le Roi Charles II. à Flamsteed: "Rectifier les tables des mouvements de ciel et les positions des étoiles fixes en vue de la détermination des longitudes en mer pour perfectionner l'art de la navigation."

C'est le 10 août, 1675, que fut posée la première pierre de l'observatoire. Pendant les 44 ans qu'il y travailla, Flamsteed forma un catalogue d'étoiles qui fut l'origine des catalogues ultérieurs.

Ce fut une coïncidence bien importante que celle de la période pendant laquelle Newton fit ses grandes découvertes avec les premières décades d'existence de l'Observatoire de Greenwich. On vit Halley, ami de Newton, indiquer la date probable de retour de sa comète, en annonçant qu'elle aurait une année de retard; ce furent 600 jours. Bradley, observateur d'une habileté exceptionnelle déduisit de ses propres observations l'aberration de la lumière, puis la nutation: son catalogue dont Le Verrier reprit la réduction est devenu la base de l'astronomie de position. La série continue des observations méridiennes de Greenwich est la plus importante dans le monde. Airy, directeur pendant 40 ans publia de très nombreux mémoires sur les sujets les plus divers. Après lui, Christie agrandit considérablement l'observatoire et y installa d'admirables instruments dus à des libéralités inoubliables. Les trois quarts des instruments actuels ont été établis par lui.

Et le successeur de Christie, Sir Frank Dyson, a poursuivi cette œuvre de perfectionnement en même temps qu'il élaborait de très importants mémoires pour lesquels la Société Royale Astronomique lui a, cette année même, décerné sa médaille d'or. Parmi les instruments nouveaux je dois citer l'équatorial photographique de la carte du Ciel. Mais cela m'amène à dire quelques mots de l'Observatoire de Paris.

Cet observatoire avait été fondé en 1666 par Colbert, et nous comptons célébrer en 1916 son 250^e anniversaire; mais nos pensées, alors, étaient ailleurs.

Comme Flamsteed à Greenwich, le premier astronome, J. D.

Cassini, était propriétaire de ses instruments : le programme était de faire toutes observations utiles. C'est 125 ans plus tard que Lalande observa son catalogue de 50,000 étoiles, mais à l'école militaire. Je m'empresse de dire que la publication en a été faite bien des années après par Bailey à qui les astronomes français et ceux de tous pays ont été toujours reconnaissants. C'est en 1827 qu'Arago a établi, à l'observatoire, des observations méridiennes, et de 1837 à 1900 on y a réobservé les étoiles de Lalande ; ce catalogue aujourd'hui est entièrement terminé, il ne reste qu'à en imprimer 50 feuilles.

Dès 1832, Biot avait dit tout haut à l'Académie des Sciences qu'il y aurait lieu de réinstaller l'observatoire dans la banlieue de Paris. Bâti par Perrault à 2 kilomètres seulement de la Cité, il était déjà, il y a un siècle, menacé d'encerclement. L'Observatoire de Greenwich a été construit à 10 kilomètres de la Cité de Londres, et dans un Parc Royal. On y travaillera longtemps encore ; à Paris, la plupart des travaux de premier ordre sont actuellement impossibles.

Cependant on a fait fructueusement de grands efforts à Paris. C'est l'impossibilité d'achever l'atlas de Chacornac qui a amené P. et Pr. Henry à perfectionner et organiser la photographie astronomique. L'Admiral Mouchez, d'accord avec David Gill, astronome de sa Majesté Britannique au Cap, en réunissant à Paris un Congrès demeuré célèbre, en a doté le monde. En Angleterre, Greenwich et Oxford ont assumé une part du travail et l'ont promptement terminée et utilisée ; en même temps, leurs directeurs et leurs astronomes créaient méthodes tout-à-fait appropriées à leur but. Sir Frank Dyson, H. H. Turner, Arthur Robert Hinks sont ici. Ils sont admirés de tous.

L'Observatoire de Paris a pu, en son service méridien, surmonter les difficultés qu'offraient les observations pour la détermination de l'heure, et assurer le service mondial des signaux. Nous traversons, certes, une période bien difficile. Mais les Français, à l'occasion, savent vouloir. Permettez-moi, à la veille du jour où je vais laisser ma tâche à un autre de terminer ce speech, trop long déjà, par un cri de pleine confiance dans le présent et dans l'avenir.

Dr. Campbell. It is always pleasant to attend birthday parties—they are bright and cheery occasions ; but it is a special pleasure to me to be asked to take an active part in celebrating the birthday of the scientific institution whose fame is more widely spread over the Earth than that of any similar institution. I am fairly well acquainted with the history of the Royal Observatory—all astronomers are,—and I am confident that my colleagues from America and other continents will agree with me in the view that the Observatory at Greenwich, though venerable with age, is just in its prime. Certainly it was never more vigorous than it is to-day. It was never more influential than it is now. It is wide awake to the needs of the astronomy of the present and of the

immediate future. In those limited fields of astronomical research which it has undertaken to cultivate, its position is most enviable, as all present are aware, and the Lords of the Admiralty may well be proud of their charge.

Now that the astronomers and chronometers and wireless signals have made the locating of ships at sea a simple and accurate matter, it is more difficult than ever to realize that the original purpose of founding the Royal Observatory at Greenwich was to provide an organisation charged with the definite duty of finding a method of determining the longitudes of ships on the high seas. Ships two and a half centuries ago did sail everywhere upon the oceans, most of them reached their destinations, by some means; but those were days when there was time to burn, and no one seemed to be in a hurry. If the ship's master was aiming for Boston he generally got his vessel on the latitude of Boston when he was still hundreds of miles east of it, and then he sailed a westerly course until the sailor at the mast-head sang out "Land Ho!"

"Land Ho!" Well, the processes of evolution as to longitude determinations and in practically all fields of activity have carried us far in the meantime—Mr. Bryan, of Dayton, Tennessee, to the contrary, notwithstanding. For example, the Royal Observatory has grown from the original observing-station, consisting largely of a room through the windows of which Mr. Flamsteed, the first Astronomer Royal, could point a small portable telescope; up to the great and well-equipped observatory of to-day, capable of meeting the modern needs of the Admiralty, and, further, of doing its share to increase our knowledge of the heavenly bodies.

On this occasion I beg to refer briefly to an incident or, rather, an episode, by way of acknowledging my personal obligations to the British Admiralty, and of expressing my admiration for its personnel. Twenty-seven years ago, when I was a young astronomer, I journeyed to India, and some two hundred miles inland from Bombay, to observe a total solar eclipse, which was to occur under most promising weather conditions, and last nearly two minutes. It was easy to take half-a-dozen instruments with me from California, but it would have been a serious matter for half-a-dozen observers to travel to the opposite side of Earth and back again, just for the two minutes of observation. The instruments were all photographic, and after I should have them placed in correct position and in working order, it would be practicable and easy in two or three days to train good men who had been accustomed to doing things on schedule, to make the photographic exposures when the man at the chronometer called off the time in seconds. Through the leading newspaper of Bombay, I caused it to be announced that I was hoping to secure the services of five volunteer assistants. Almost immediately the officer in command of the British warships in Bombay Harbour called on me, and said that, if I thought he and some of his

torpedo-boat commanders could take the photographs to my satisfaction, they would come to my station. The officer in command was Captain Harry L. Fleet, R.N., who, as Vice-Admiral Fleet, made the last of all ports, I regret to say, two years ago. To shorten the story, which I delight to recall, Captain Fleet and his four officers were assigned to their instruments and trained to their duties with them. Lieutenant Corbett was assigned to count aloud the seconds from the beat of the chronometer, so that the observers at the instruments could hear him and make the photographic exposures between certain seconds. The programme had been so arranged that each observer could look up at the eclipsed Sun, and see the magnificent solar corona during at least fifteen or twenty seconds. Lieutenant Corbett, with the chronometer placed alongside his head, could hear the chronometer-beats clearly and continue the counting of seconds while looking up at the sky. The critical two minutes of the eclipse came, the chronometer-counting was done to perfection, and the entire programme of observations went through on schedule without a hitch. Soon the observers collected to discuss the marvellous phenomenon—one worth travelling thousands of miles to see, even for only one minute and fifty-eight seconds. Captain Fleet noticed that Corbett was keeping quiet, and asked him, "Corbett, what did you think of the Corona?"

"I didn't see it, Sir!"

"What! What! How's that?"

"Well, sir, realizing how important the counting was for the success of the expedition, and having a slight defect of hearing, I feared that if I looked up at the eclipse, I might mix things up a bit, and so I just kept my eyes glued on the chronometer, Sir!" Corbett went to the eclipse, but he didn't see the eclipse. He is no longer in the land of the living. Peace be to his ashes, and hail to the perfection with which he represented the spirit of the British Navy.

Mr. Chairman, in my early life, on the plains of the Deccan, I acquired high respect for the Royal Navy. I am glad that the responsibility for holding down the zero meridian, from which all terrestrial longitudes are reckoned, falls to the Royal Observatory at Greenwich and to the British Navy. In the name of many astronomers and many observatories, I felicitate Sir Frank Dyson, the Astronomer Royal, and the members of his staff, and, likewise, the Lords of the Admiralty, upon the splendid history of the Royal Observatory in the two and a half centuries of its life, upon the honourable position which it holds to-day, and upon the valued contributions to astronomical science which it will make in the years to come.

Prof. Turner. M. Baillaud has represented an Observatory nearly contemporaneous with Greenwich, and President Campbell has spoken for those wonderful modern Observatories in the

United States. Perhaps I may first say a word of thanks on behalf of the more ancient institutions—for we have here representatives of Denmark, where formerly Tycho made fundamental observations with no telescope at all; on behalf of Italy, where Galileo first turned a telescope on the heavens; and of Holland, where the telescope was invented—unless, indeed, it was invented in Oxford. But the actual rôle assigned me by Sir Frank Dyson was to represent England—Cambridge, where the Astronomers Royal come from, or, at least, have come from for 150 years, as we heard during our very enjoyable visit just completed; and, again, Oxford, where the Astronomers Royal used to come from.

For Oxford provided Halley, Bradley, Bliss. No words of mine are needed to extol the first two; but the fame of Bliss is not widespread, partly because he was only Astronomer Royal for about two years. However, two notable things characterize him. He was at the same College as Dr. Johnson, our great representative Englishman. At Pembroke College, Oxford, they treasure a fine portrait of Dr. Johnson by Sir Joshua Reynolds; and they also treasure an etching of Bliss, drawn by a boon-companion on the base of a pint-pot, and surrounded by the inscription, "This sure is Bliss, if Bliss on Earth there be." Now, I venture to think that those words have an inner meaning. I do not refer to the alternative meaning probably intended by the sly artist when he made his drawing on the pint-pot, which (I may explain to the Americans present) is intended for drinking out of. There is another possible meaning. We may surely take the Astronomer Royal of the time to typify Astronomy itself, which to us is bliss. We would all sooner be astronomers than anything else in the world, as Hale has said. And nowhere is this devotion better exemplified than at our Royal Observatory, where there is a large and happy family working under their great chief—so happily that some of them can scarcely be got away from the Observatory day or night. And, as I am the last speaker, I will venture to borrow a good old custom from another happy family to which Professors of Astronomy (as I am) and Professors of Geometry (as Halley and Bliss were) now both belong—the Wykehamist family at New College. Their tradition is to wind up their proceedings with the sentiment *Stet Fortuna Domus*, followed by the singing of *Dulce Domum*. And so I say with regard to the Royal Observatory we are honouring—*Stet Fortuna Domus*. And may I translate it thus:—*Stet*, may the transit-circle stand firm; *Fortuna*, and may they have good luck; *Domus*, in the Big Dome.

It may be of interest to reprint here the warrants for the payment of the first Astronomer Royal's salary and for the building of

the Observatory. The foundation-stone was laid on 1675 Aug. 10, and Flamsteed came into residence the next summer.

"Warrant for the Payment of Mr. Flamsteed's Salary."

"CHARLES REX.

"WHEREAS, we have appointed our trusty and well-beloved John Flamsteed, Master of Arts, our astronomical observator, forthwith to apply himself with the most exact care and diligence to the rectifying the tables of the motions of the heavens, and the places of the fixed stars, so as to find out the so-much-desired longitude of places for the perfecting the art of navigation, Our will and pleasure is, and we do hereby require and authorize you, for the support and maintenance of the said John Flamsteed, of whose abilities in astronomy we have very good testimony, and are well satisfied, that from time to time you pay, or cause to be paid, unto him, the said John Flamsteed, or his assigns, the yearly salary or allowance of one hundred pounds per annum; the same to be charged and borne upon the quarter-books of the Office of the Ordnance, and paid to him quarterly, by even and equal portions, by the Treasurer of our said office, the first quarter to begin and be accounted from the feast of St. Michael the Archangel last past, and so continue during our pleasure. And for so doing, this shall be as well unto you, as to the Auditors of the Exchequer, for allowing the same, and all other our officers and ministers whom it may concern, a full and sufficient warrant.

"Given at our Court at Whitehall, the 4th day of March, 1674-5.

"By his Majesty's Command,

"J. WILLIAMSON.

"To our right-trusty and well-beloved Counsellor, Sir Thomas Chichely, Knt., Master of our Ordnance, and to the Lieutenant-General of our Ordnance, and to the rest of the Officers of our Ordnance, now and for the time being, and to all and to every of them."

"Warrant for Building the Observatory."

"CHARLES REX.

"WHEREAS, in order to the finding out of the longitude of places for perfecting navigation and astronomy, we have resolved to build a small observatory within our park at Greenwich, upon the highest ground, at or near the place where the Castle stood, with lodging-rooms for our astronomical observator and assistant, Our will and pleasure is, that according to such plot and design as shall be given you by our trusty and well-beloved Sir Christopher Wren, Knight, our surveyor-general of the place and scite of the said observatory, you cause the same to be fenced in, built and finished with all convenient speed, by such artificers and workmen as you shall appoint thereto, and that you give order unto our Treasurer of the Ordnance for the paying of such materials and workmen as shall be used and employed therein, out of such monies as shall come to your hands for old and decayed powder, which hath or shall be sold by our order of the 1st of January last, provided that the whole sum, so to be expended or paid, shall not exceed five hundred pounds; and our pleasure is, that all our officers and servants belonging to our said park be assisting to those that you shall appoint, for the doing thereof, and for so doing, this shall be to you, and to all others whom it may concern, a sufficient warrant.

"Given at our Court at Whitehall, the 22nd day of June, 1675, in the 27th year of our reign.

"By his Majesty's Command,

"J. WILLIAMSON.

"To our right-trusty and well-beloved Counsellor, Sir Thomas Chichely, Knt., Master General of our Ordnance."