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Some Papers of Nevil Maskelyne.

As stated in the Oxford Note-Book last month, the recent death of Prof. Story-Maskelyne has brought to light a collection of books and manuscripts which belonged to his grandfather, Nevil Maskelyne, the fourth Astronomer Royal. The majority of these have been deposited at Greenwich by Mrs. Story-Maskelyne, and we are kindly permitted by the Astronomer Royal to make use of them for publication. Among the MSS. are some essays on astronomical subjects and some correspondence of Maskelyne, extracts from which may be found of interest*.

Of the papers that it is not proposed to give in detail, mention may be made of a large number of notes of the nature of instructions and precepts for computing such things as the time of Moon's transit, which perhaps formed part of the early work on the *Nautical Almanac*, or were used in preparation of Maskelyne's 'Mariner's Guide'; also papers which come under the head of "Instructions for Observing," some of which bear evidence of having been affixed to a notice-board, and were possibly written for the guidance of his assistants.

A small section which might come under the heading "Observations," includes the journal of the voyage made by Maskelyne to St. Helena to observe the Transit of Venus of 1761. It is stated in some biographies that he made the journey in the 'Seahorse,' but it is evident from these papers that the ship he sailed in was the East-Indiaman 'Prince Henry,' Charles Harris, Commander. Mason and Dixon, who started on a journey to observe the transit from Bencoolen under instructions from Bradley, but did not get beyond the Cape of Good Hope, sailed in the 'Seahorse,' which may have given rise to the error. There

* We are indebted for the selection and help in the preparation of this to Mr. W. W. Burkett, of the Royal Observatory, Greenwich, who has made a complete examination of these papers.

are also to be found the observations made at sea by Maskelyne when he made the voyage to Barbadoes in 1764 in H.M.S. 'Princess Louise,' he being chaplain, for the purpose of finding the longitude of the island preparatory to testing Harrison's chronometer, and the original observations of equal altitudes and transits made on the island by Charles Green and Maskelyne, some of which are given in an Appendix to the 'Account of the Going of Mr. John Harrison's Watch,' published by Order of the Commissioners of Longitude in 1767. In this section may be included the notes made at the "discovery" of Harrison's chronometer, when Harrison explained the construction of his instrument to the Committee appointed by Parliament. These notes are not unknown, for they were printed in a somewhat modified form in Maskelyne's 'Principles of the Timekeeper.' The following may be taken as typical :—

The grand principle of Harrison's watch is that of giving the greatest motion possible to the Balance with a given Force. This is done by the scaping and proper quantity of arc described.

Among a small collection of observations of a miscellaneous nature communicated to Maskelyne, there is a report of the astronomical observations made at St. Andrew's town in Passamaquoddy Bay under authority of an International Commission by Thomas Wright, Astronomer on the part of His Britannic Majesty, and Mr. Samuel Webber, Astronomer on the part of the United States of America, to determine which was the River St. Croix truly intended by the Treaty of Amity, Commerce, and Navigation concluded on the 19th day of November, 1794*. The journal of a voyage in H.M.S. 'Investigator' made by John Crossley in 1801-3, at the instigation of the Board of Longitude, who had been assistant to Maskelyne in 1787 and again in 1792, may be alluded to. Crossley was instructed to proceed to New Holland to make definite observations tending to the improvement of geography and navigation, for which he was to be paid at the rate of £400 per annum, but owing to ill-health was obliged to come home after reaching the Cape. Crossley was the possessor of the only reliable time-keeper in the fleet on the home voyage, and reported that twice a week he signalled the longitude to the Admiral.

Among the papers are several letters written by Maskelyne

* The production of this manuscript is very opportune, for a brief history of the subject is given in the last published Report of the Chief Astronomer for Canada (1909), a treaty between His Majesty and the United States providing for the survey of the whole of the boundary-line from the Atlantic to the Pacific having been ratified on June 3, 1908.

"By the treaty of 1783 the boundaries of the United States were defined as beginning at the mouth of the St. Croix River and ascending that river to its source. Soon afterwards question arose as to which was the St. Croix mentioned in the treaty; it appears that three or more rivers bore that name. Commissioners were appointed to decide which was intended."

which were obviously sent to the persons to whom they are addressed, though there is no direct information how they came back into the hands of Maskelyne's family. A number of letters to Charles Mason, who had been assistant to Bradley and was author of certain lunar tables which were used in the computations of the *N. A.*, are tied together neatly in a packet and docketed by Mason, and it may be inferred that these were handed by himself or his representatives to Maskelyne's family. The first of these letters contains instructions for observation of the Transit of Venus (1761) and financial arrangements for the journey. In a later letter Maskelyne refers to observations made by Mason at the Cape of Good Hope, and, on the subject of an appulse of σ Sagittarii to the Moon that Mason had observed, encloses a translation of a paper by Pingré, in which he (Pingré) says "it is certain that this was more than an appulse, and that the star was eclipsed at the Cape." Mason, evidently in a spirit of sarcasm, has added a note to the letter—"Then it is certain that Mr. Pingré's Lunar Tables and computations are more to be depended upon than Mr. Dixon's eyes and mine: our eyes were assisted with two reflecting telescopes, each magnifying 120 times."

The other letters to Mason refer to his expedition to Ireland to observe the Transit of Venus of 1769, most of them being addressed to Cavan, near Strabane, in the county of Donegal; and it appears that the cost of postage of a letter was 10d., and that the interval between dispatch and receipt was a fortnight or three weeks. Mason was sent at the expense of the Royal Society, and was to receive 100 guineas for maintenance and gratuity, 20 guineas for the return journey, the cost of conveyance of instruments being defrayed. It was at first proposed that he should remain at Londonderry from March 8 till July 8, but the transit having been observed he had to remain until November to determine the longitude of the station, and for this Maskelyne procured for him an addition to the agreed sum.

Of the other letters written by Maskelyne, three appear to be of such interest that we print them in full. The first is an account of what transpired during his examination by the Select Committee on the going of Harrison's Timekeeper. It will be remembered that Maskelyne has been charged with partiality in his capacity as arbitrator on the merits of Harrison's chronometer, and that, being an astronomer, he was prejudiced in favour of the lunar method for determining longitude.

Palsgrave Court, London.
March 6, 1765.

DEAR SIR,—

I should have set down yesterday to give an account of what had passed at the house of Commons about the longitude if anything had been done, but when My Lord Morton was introduced into the house about four o'clock (the affair of the purchase of the Isle of Man from the Duke of Atholl having detained the attention of the house till that time) his Lordship declared that his eyes were too weak to recur to his papers to assist his memory on the

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points he might have occasion to speak of, and therefore hinted his wish that the affair might be put off to another day, which the house very complaisantly determined and put off the Committee to this day twelve o'clock. The house accordingly entered upon this affair about 3 o'clock, and Lord Barrington told the house that Lord Morton not having received a summons to attend the house was not prepared so to do, and Lord Barrington proposed that the Committee might be put off to some other day: but several of the members thinking the presence of Lord Morton not so absolutely necessary as to stop the house from proceeding upon business, and that he might be heard some other time, it was agreed to resolve the house into committee for the consideration of the longitude, the power of which Committee had been enlarged by a previous resolution that they should consider the minutes and proceedings of the board of longitude and of Mr. Harrison's watch and Mr. Mayer's lunar tables.

Accordingly the house was resolved into Committee about half-past 3 o'clock, and I was presently called in and examined by several members for about an hour; after which Capt. Campbell was examined for about a quarter of an hour, and then the Committee adjourned their business until next Friday.

1st. I was asked how near Mr. Harrison's watch determined the longitude of Barbados? I answered considerably within the nearest limit of the 12th of Queen Anne. I was asked if I thought the watch kept its longitude during the voyage within the same limits of the act? I answered that the point in question was incapable of demonstration, but from the near agreement of the watch with the longitude of Barbados I thought it highly probable it did keep its longitude during the voyage within the nearest limit of the act of Parliament. I was asked if the observation of equal altitudes of the Sun at Portsmouth did not by these differences shew such irregularity in the going of the watch as to prove it could not be depended upon during the course of the voyage? I answered that a supposed error of $2\frac{1}{2}$ seconds in each day's observations at Portsmouth would reconcile those observations with one rate of going of the watch to half a second, that it would be difficult to say that the greatest part of this error did not lie in the observations themselves, but even allowing the observations to be exact the difference of the rate of going of the watch in any one of the three weeks from the mean rate of the going there would not throw the watch out from determining the longitude of Barbados within the nearest limit of Act of Parliament; and that the going of the watch agreed with the account Mr. Harrison gave relative to the state of the thermometer so near that the difference would in no case throw the watch out from determining the longitude within the nearest limit of the act. I was asked if I thought a trial of three weeks sufficient to determine the rate of going of the watch for the voyage? I answered yes, supposing the watch goes uniformly. I was asked if I thought 3 weeks' observations or 2 weeks' observations at the distance of 3 weeks sufficient to determine the rate of going of the watch for a 6 months' voyage? I answered yes, supposing there was no reason to suspect the observations of considerable inaccuracy and that the going of the watch was uniform. I was asked if I thought the watch would not be liable to much greater error if sent to countries lying to the north or to other climates different greatly in temperature from our own? I answered that the present time-keeper might probably err more in such voyages than in the late voyages except a thermometer was made use of by which allowance might be made for the changes of heat and cold, but that as the irregularities of the watch depending on heat and cold were so small, it was not improbable that Mr. Harrison might with more time and attention make other watches from the same principles which might keep their rate of going correctly under the different changes of heat and cold. I was asked what trials I had made of the lunar method; how near I made the longitude of Barbados in going out and of the land of England in returning? I answered that I had corrected the ship's reckoning in the voyage to St. Helena, from 7 to 10 degrees and probably saved the ship from losing her passage by so great a mistake. That I made Barbados by my last observations within half a degree of the

truth and the Isle of Wight on my return to within 16 minutes, which (agreeably to a question asked me) I said was about the same exactness with which Mr. Harrison's watch made Barbados, but that I did not make Barbados by my observations so near as Mr. Harrison's watch made it.

I was asked how many days the observations of the Moon might fail of determining the longitude, supposing the weather always clear? I answered about 3 days in the month within the tropics, and perhaps about 5 days near the change of the Moon in these northern latitudes. I was asked what observations were necessary for finding the longitude by the watch and what by the Moon? I answered 2 altitudes of the Sun, one of which must be at or near the noon, were necessary for finding the longitude by the watch, and, besides these, one observation at least of the distance of the Moon from the Sun or a fixed star. I was asked if more observations could not be taken for finding the longitude by the watch than for finding it by the Moon, owing to the great brightness of the Sun's body? I answered yes; that a less degree of clearness of the air was sufficient for finding the longitude by the watch than was necessary for taking the observations of the Moon. I was asked if I did not think both methods put together would not greatly assist each other? I answered that I thought it probable if both were put together they might in a manner generally determine the longitude at sea very nearly. I was asked if the calculation by the Moon would not be more operose than the calculation for finding the longitude by the watch; I answered that with the help of a proper nautical almanack all the difficult part of the calculations by the lunar method might be taken away, and that the remaining part to be done at sea might be practiced on board of every ship, if the persons belonging to it would give proper attention to it; but that the calculations would be always somewhat conciser in the method by the watch than in that by the Moon. I was asked how near I had found by experience the longitude might be determined by observations of the Moon? I answered I could not find any reason to think that I had ever erred a whole degree in determining the longitude by Mayer's printed tables. I was asked if the manuscript corrections of the tables were not more correct than the printed ones? I answered I had formerly understood from Dr. Bradley that the manuscript tables were much more exact than the others. I was asked what other persons had made any improvement in the lunar tables besides Mayer? I answered Sir Isaac Newton had first brought the lunar table to a tolerable degree of perfection, that the error did never exceed 5' or 6'; in which state they continued as I apprehended till Mr. Mayer improved them to their present perfection upon Sir Isaac Newton's principles. That Mr. Euler, Professor at Berlin, found out a new and more accurate method of computing the inequalities of the Moon, according to Sir Isaac Newton's principles, and by this method himself made new tables of the Moon, which, however, I believed were not much if at all superior to Sir Isaac Newton's in accuracy. But that Mr. Mayer, by pursuing Mr. Euler's plan, had succeeded so as to bring the tables to the present degree of perfection, so as seldom to err more than 1 minute. That Mr. Dunthorne of Cambridge had also made some improvements upon Sir Isaac Newton's theory, tho' no ways or in any degree comparable to those made by Mr. Mayer. I was asked which method of the two of finding the longitude I should rather depend upon? I answered that as I had had more experience of the certainty and usefulness of the method of finding the longitude at sea by observations of the Moon, I should depend more upon it than upon the method by Mr. Harrison's watch in long runs. I was asked whether the observations of the Moon made on different days would correct one another? I answered yes. I was asked whether the watch had the same advantage? I answered no; as the errors to be feared in a watch would probably be the same nearly on two or more successive days, but the errors resulting from the observations of the Moon would not necessarily nor probably come out the same.

Capt. Campbell was asked many of the same questions as I was, to which he answered generally much to the same effect as I did, but with more reserve and many the questions he evaded; and he said that he had once been a whole

revolution of the Moon without an observation of the Moon for the longitude. I suppose Lord Morton will be examined on Friday, if he is not affronted that the Committee was not put off that he might be examined first. I thought it proper to call at Lord Morton's this evening and sent in my name, but his Lordship returned an answer that he was engaged: indeed the servant told me before that he was not at home. I think he cannot have any reason to be offended at me. The Royal Society have received their visitational power, but the regulations remain in the same state of uncertainty as before; only Mr. Phelps having talked with Dr. Morton thinks it proper that I should myself signify what observations were made by the servant in my absence, and that those made even by the servant under my inspection should be considered as my own. Favor me with your sentiments on this head. I received the favor of your letter. My brother will be at Cambridge in a day or two, who can inform you of what passed at the house, more particularly as he was present. The Council were not so well satisfied with my objections to the disagreeable regulation as I thought for. Present my duty to Dr. Smith.

Yours, &c. &c.,

N. MASKELYNE.

March 7, 1765.

POSTSCRIPT.—I shall continue here till this day sennight. After y^t direct to me at Ld. Clive's. Read this letter to Dr. Smith, and you will much oblige me by giving me his and your opinion about my answers to the questions of the committee.

Maskelyne has not appended the name of the friend to whom the letter was addressed, but it may be inferred that it was to Rev. Antony Shepherd, F.R.S. (1721–1796), Plumian Professor of Astronomy, the friend of Lord Sandwich, and a man of considerable influence, who was on terms of great intimacy with Maskelyne. The inference is drawn from the letter which follows, which was probably addressed to the same gentleman. The Mr. Betts referred to was the Rev. Joseph Betts, Savilian Professor of Geometry at Oxford, and a Member of the Board of Longitude.

DEAR SIR,—

London, October 20, 1764.

Before I receiv'd your letter I had call'd at Lord Sandwich's house, but had not seen him, he being out of town. I have since had the honor of paying my respects to his Lordship, as also to the Right Hon. Mr. George Grenville, and Lord Egmont. I understand that Lord Sandwich and Mr. Grenville have done and will continue to do all the good offices they can towards procuring me the Greenwich Professorship; they have both recommended me to the King. Lord Morton has been also greatly my friend, and has recommended me to the ministry in the strongest manner, so long as 4 months ago, before Bliss's death.

The whole contest seems lie between Mr. Betts of Oxford and myself: he has been strongly recommended by Lord Litchfield and others of his Oxford friends. Mr. Grenville advises me to proceed in the same manner, to obtain testimonials (so he call'd Mr. Betts recommendations) in my favor from my learned friends.

Lord Morton has promis'd to give me the honor of his name at the head of the noblemen and gentlemen whom I shall endeavor to prevail on to sign my recommendation here, most of them gentlemen of the Royal Society, eminent in Astronomy mathematic or literature in general. I think it proper to solicit from the Professors and other gentlemen learned in the philosophical way at Cambridge a like recommendation signed with their names. Mr. Professor Waring, who is in town, has promised to sign the recommendation. I shall beg leave to trouble you to write it for me and to wait on the proper gentlemen and beg their names to the testimonial. You will

probably think with me that it will be best only to have the names of the Professors, or those eminent in the Philosophical Sciences. Dr. Smith, I hope, will do me the honor to subscribe the testimonial, and I doubt not Dr. Long will also, when you wait upon him. Then be pleased to favor me with your own name. I shall get Mr. Waring to sign it here. Could you not obtain me also the names of Dr. Rutherford, Dr. Powell, and Dr. Mason, but let me leave it to your discretion to choose or omit as you shall judge best. I beg the favour of an answer to acknowledge the receipt of this, by the next Post. I had almost forgot to inform you that the form of the testimonial which my friends here have drawn up for me is as follows:—

The Rev. Mr. Nevil Maskelyne, F.R.S., having approv'd himself, on several occasions, to be well skill'd in the theory and science of Astronomy, as a mathematician; and also in the practical part of Astronomy, as a diligent and accurate observer; we judge him to be very well qualified to execute the office of His Majesty's Astronomer at Greenwich.

Your testimonial which ought to be different, suppose it was to run something thus? The Rev. Mr. Nevil Maskelyne, A.M., F.R.S., Fellow of Trinity College, Cambridge, by his *known* skill in the Theory and Practice of Astronomy* appears to us to be a very proper person to serve his Majesty in the office of his Astronomical Observer at Greenwich. But word it as Dr. Smith shall approve, and yourself shall think proper. I need not tell you that the sooner the testimonial can be expedited the more serviceable it may be. I flatter myself with the hopes of obtaining this Professorship at last, which you know was always my earnest wish; the readiest step to which will be by these testimonials. I apprehend Mr. Grenville proposes to do me the honor to present them to the King. Be pleased to take care that the gentlemen's titles or additions be adjoined to their names. Adieu

Dear Sir,

London, Oct. 20, 1764.

My direction is at
John Walsh's Esq.,
in Chesterfield Street,
near Berkley Square.

Your affectionate friend
and humble servant,
NEVIL MASKELYNE.

NOTE.—The word and footnote in italics are inserted, and are in the handwriting of the recipient of the letter.

This next letter, which is in draft, is self-explanatory. John Brinkley was Assistant to Maskelyne from 1787 June 23 to November 9 in the same year, when he left to go to Cambridge, and was Senior Wrangler in 1788. He returned to Greenwich from 1788 January 27 to March 28, and was appointed Andrews Professor at Dublin in 1792, being afterwards Director of the Observatory at Dunsink and Royal Astronomer for Ireland:—

SIR,—

Greenwich, Nov. 29, 1790.

In answer to your favour of the 22nd, which you sent me in the name of the Provost and Senior Fellow of Trinity College, Dublin, I am to inform you that Mr. Hellins was my Assistant for $2\frac{1}{2}$ years, between Michaelmas 1773 and Lady Day 1776, six months of which I was absent in the experiment which I made for the Royal Society on the attraction of the mountain Schiehallien in Scotland. It was not expected that that experiment would have taken me above two months, but owing to the extraordinary bad weather it happened otherwise. My going to Scotland was a matter not of choice but necessity. The Royal Society, thinking that the person then actually employed by them

* *Astronomy and Navigation.*

in the surveying part of the business had been my Assistant could not be depended upon to complete the work and publish the result, or at least that the world would not be satisfied therewith on account of his inferiority of education and situation in life, made a point with me to go there to make the direction of the experiment, which I did, not without reluctance, not out of any wish to depart from my own observatory to live on a barren mountain, but purely to serve the Society and the public, for which I received no gratuity, and had only my expenses paid for me. The like objection to what was made to Mr. Burrough, as not being a person of weight enough to be trusted with the conducting of the experiment of Schehallien, seems equally to weigh against the appointment of Mr. Hellins to the Professorship of Astronomy near Dublin, who is not a graduate of any University nor had any University education, consequently it may be reasonably doubted whether he has obtained that comprehension of mind which a regular and liberal education produces, or whether he be skilled in the Newtonian Philosophy which Dr. Hall, in his letter to me written in the name of the Provost and Senior Fellow, represented as a matter of the first consequence in the merits of a candidate for the place, and I think justly. Mr. Hellins, however, though capable of the common business of observing, was the least serviceable Assistant I ever had, especially in the calculation of observations, in which he made so little progress that I thought it necessary to part with him. This defect on his part I attributed to his weak constitution and delicate state of health, which will equally weigh against him on the present occasion, especially as an active person is wanted to set forward and promote a new establishment. Had I thought Mr. Hellins to be the person best qualified for your professorship I should have recommended him at first. My intention was certainly to recommend the best person I knew to the College; I therefore first recommended Mr. Vince whom it appeared afterwards it did not suit. I then recommended Mr. Brinkley. Neither Mr. Vince nor Mr. Brinkley nor any of their friends knew of my intention to recommend them, nor made any applications to me on the subject; indeed, they did not know that the office was to be filled up. Neither has my recommendation of Mr. Brinkley been owing to any particular friendship or esteem for him more than his merits obtained for him, as I knew nothing of him till he became my Assistant, and he left me much against my will upon superior advantages being offered him from his College.

I am, with much respect to the Provost and College, Sir,

The Rev. DIGBY MARSH,
Register [*sic*] of Trinity College, Dublin.

Your most obedient Servant,
N. M.

Planet MT.

WE have to chronicle an astronomical romance with a sad ending (as far as present information extends). On September 29 Dr. Palisa discovered a small planet, MS, and in the course of his work missed a star which was on the photographic chart. He accordingly returned to the same region on October 3, and then noted two objects in close proximity which were changing their relative positions. He naturally supposed at first that the motion of the moving body was retrograde, the region being in opposition to the Sun. Comparison with the chart showed, however, that the moving body was not the one he had supposed, but the other one of the pair, and that the motion was direct. Though interrupted by clouds, further measures were taken to confirm this: