FURTHER REMARKS

ON THE

PRESENT DEFECTIVE STATE

OF THE

NAUTICAL ALMANAC.

TO WHICH IS ADDED

AN ACCOUNT OF THE

NEW ASTRONOMICAL EPHEMERIS

PUBLISHED AT BERLIN.

EXTRACTED FROM THE

Appendix to Astronomical Tables and Formulæ

By FRANCIS BAILY, F.R.S. &c. &c. &c.

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NAUTICAL ALMANAC.*

THERE is probably nothing that contributes so much to the progress and improvement of astronomy,—nothing that tends in so great a degree to keep alive a spirit of enquiry and research in this science,—as the annual publication of a correct and comprehensive Ephemeris; containing, in a concise and tabulated form, all the motions of all the heavenly bodies, computed from the best elements that can be obtained. It was this feeling which induced the Government of this country in 1765 to establish the Nautical Almanac, and to cause it to be published under its own authority: the good effects of a similarly authorized national Ephemeris having been experienced in several of the neighbouring states. The work was consequently placed, by a special act of parliament, under the direction of the Board of Longitude, then recently established, and the first volume appeared in the year 1767.

In the infancy of the science (for the *present system* of astronomy is of no very ancient date) the public were satisfied

* Some of the points alluded to in this article were arranged in the shape of a letter, and inserted in the *Times* newspaper of Nov. 19, 1828.

with the meagre details thus given in the Nautical Almanac: a work which was perhaps sufficiently well adapted to the wants of astronomers at the time of its establishment, but which falls far short of what is *now* required. New discoveries and new modes of observing—a more refined analysis and more improved instruments—have given rise to new wants and to new claims: so that what might be well suited to the last century is no longer tolerable in the present one. Many of the states on the continent have long seen this, and have improved their national ephemeris accordingly: and this improvement has most unaccountably been in the inverse ratio of their interest in navigation and nautical astronomy, which it is said these publications were originally and principally intended to promote *. Indeed, it has been pertinaciously maintained by some persons, that the Nautical Almanac was originally established *and is now continued* for this *sole* purpose: whilst others consider that it ought to partake more fully of (what its title imports) an *astronomical* ephemeris. But it will not be difficult to show that it is not adapted either for one or the other (at least to that extent which the present state either of navigation or astronomy demands): and that it is a constant charge upon the nation, without any equivalent advantage to science.

That it is not intended *solely* for the navigator is evident from an inspection of its contents. For, of what use are the eclipses of Jupiter's satellites to the sailor? How is he benefited by knowing the places of Mercury, and the Georgium Sidus; planets which are seldom seen even on shore? What does he want of the apparent places of *sixty* principal stars? And as to the positions of the Sun and

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* Witness the ephemerides of Coimbra, Berlin, and (*proh pudor!*) Milan.

Moon, if they are required merely to work out a *lunar* (as it is technically called), or to determine the latitude, a much more concise form might be adopted. So that the most ample demands of the *mere navigator* (from the humble skipper to the noble admiral) might be supplied from the Nautical Almanac in a sixpenny pamphlet.

But if it is intended *solely* for navigation, or if its object be the promotion of navigation *at all*, surely it ought to contain *all* the requisite facilities for determining the problems necessary at sea. Why then are the distances of the moon from the *planets* omitted? and why do we not see a list of all the *occultations* that will occur? The ephemeris of Coimbra has, for many years past, contained the lunar distances of the planets and many of the occultations: and the *little* state of Denmark (so *great* however in works of science), well knowing the importance of the subject, annually publishes a similar list of such distances, together with the position of the planets for every day in the year, at the Hydrographer's office at Copenhagen. As to occultations of the fixed stars by the moon, it has now been long discovered that they may be observed with a common telescope *at sea* (even from the unsteady deck of a vessel), down to the sixth magnitude; as may be easily verified by any one that will take the pains to look out for them. They are the most perfect of all lunar distances: and it is sufficiently well known that they afford the *best means* of determining the longitude.

Again, if the Nautical Almanac really has the advancement of navigation in view, why does it not contain a more enlarged ephemeris of the places of the four principal planets (Venus, Mars, Jupiter, and Saturn) for every day in the year, instead of the almost useless summary which it now exhibits: so that their accurate positions may be as

ready for immediate use, when required, as those of the Sun and Moon? For these stars (and particularly Venus) can frequently be seen in broad daylight, and their altitudes consequently taken on the meridian when unfavourable circumstances prevent an observation of the sun or moon: an instance of which lately occurred in one of the American packets, where an observation of Venus *on the meridian* (soon after the passage of the sun, which was unfortunately obscured at the time) was the means of determining the latitude of the ship. An ephemeris, pretending to be for the use of nautical men, should contain *every thing* that can at all diminish the labour of computation at sea, or that will at all tend to help an enlightened sailor in pursuing his adventurous and doubtful path across the trackless ocean. He is frequently placed in situations of great difficulty, where *every* means, that can be made available for relieving him, ought to be *ready at hand.* It is but a small return we make to him for the perils he encounters.

But, if the Nautical Almanac does not contain all that is requisite for the *navigator*, how much less does it supply the wants of the *astronomer;* and how vain are its pretensions to the title of an *Astronomical Ephemeris.* It will perhaps be scarcely credible to future ages, that for a period of thirty years after the discovery of *four new planets* in our system, *not the least notice* whatever was taken of any one of them, in a work pretending to show the motions of the celestial bodies: so that no astronomer could ever tell in what part of the heavens to look for them, or make any observations to perfect their theory. And as to any knowledge he could obtain of them, they might as well be blotted out of the creation. It has been said, in excuse, that there are no accurate tables of their motions: still, imperfect tables are better than none at all, and it is so much the

more necessary to get them observed. Besides, I much doubt whether the tables of the moon and many of the planets were more correct, at the commencement of the Nautical Almanac, than the tables of the minor planets are at the present day. And it is fortunate for us that the same paltry and miserable excuse was not allowed to succeed in those times *. It is well known that it does not contain all, *nor nearly all*, the information that astronomers now require: and what it pretends to give, it does not state in that simple and correct manner which their uses demand. It ought to contain the places of *all* the planets, and notices of *all* such phænomena as the interests of astronomy require should be generally observed: and above all should be discarded altogether the absurd and useless mode of adapting the values to *apparent time;* which seems, indeed, to be retained for no other purpose than to give the practical astronomer the trouble of converting them back again into *mean solar time* before he can make use of them. But, these and various other improvements and additions have been so fully pointed out and so frequently insisted on by others as well as by myself, that it would be useless to repeat the subject here †. It is well known that about eleven or twelve years ago, the work had got into such bad repute that Mr. Croker is represented to have stated in the House of Commons that "it was become a *bye-word*

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* Dr. Maskelyne did not reason in this manner when the Georgium Sidus was discovered. The place of *that* planet is regularly given.

† See Mr. South's *Practical Observations on the Nautical Almanac;* and my *Remarks on the present defective state of the Nautical Almanac:* both published in 1822. This latter pamphlet was written as an *Answer* to some Remarks published in Brande's *Journal of Science*, wherein the writer attempted to vindicate the present state of the Nautical Almanac.

amongst the literati of Europe:" and a new (and rather expensive) Board of Longitude was consequently established, under whose auspices and direction the Nautical Almanac was in future to appear: it being anticipated that this additional expense would be attended with equivalent advantages. But the event has disappointed all our expectations: and Mr. Croker, after a trial of ten years, finding his new Board of Longitude of little or no use in promoting the objects for which it was instituted, brought in a bill (during the last session of Parliament) for its dissolution: and it now ceases to exist.

During the period, however, that the Nautical Almanac was under the direction of the late Board of Longitude, the defective state of that national work was frequently brought before them, not only by private individuals, but also by the Council of the Royal Society; and the proposed improvements were supported by the active and scientific members of that Board. But, unfortunately, whenever that learned body was assembled together to discuss these matters, some invisible and *Bœotian* influence was sure to paralyze all their proceedings; so that little or no permanent benefit has yet resulted from their efforts. And thus it ever will be with so heterogeneous a body as that which composed this assemblage of persons. The dissolution of *such* a Board was "devoutly to be wished."

It is true that some slight attempts (like angels' visits, "short and far between") were occasionally made at improvement; as it was impossible for the Board to shut their ears altogether to the universal complaints that were made. And it is probable, that to the active interference of some of the more scientific members we are to attribute the two recent SUPPLEMENTS to the Nautical Almanac, for 1828 and 1829; the Almanacs for those years having been

previously published. It is now rumoured, however, that since the abolition of the Board, these Supplements are to be discontinued: and there seems to be some ground for the suspicion, when we see the Nautical Almanacs for 1830 and 1831 subsequently appear without their expected appendages: for, surely it never could be intended that the Supplement should be constantly two years in arrear of the original work. The plain course would have been (whether any further improvements be intended, or not) to have *incorporated* them together, for the convenience of those who consult them. But, *much more* than what has been here done is required at the present day. For, so rapid have been the strides, within these few years, both in practical and theoretical astronomy, that nothing short of a remodelling of the whole work, adapted to the present improved state of the science, will satisfy the increased and increasing demands of the modern astronomer.

Whatever may be the future intentions of the Government, however, it must be evident to the most common observer that the alterations and improvements here suggested would not be altogether for the benefit of astronomy alone, since they bear very powerfully on navigation also. Many voyages of discovery and scientific research have lately been made, and many are still in a state of progress, conducted by men of high scientific attainments, who are an honour to the country that employs them, and who have the proud and enviable satisfaction of knowing that, after having triumphed in war, they can also serve her in the no less brilliant walks of peace. In fact, there probably never was a period when the Royal Navy of Great Britain could boast of so many officers so devoted to science, and so proud of promoting its objects. Many of these, *I know*, lament the present defective state of the Nautical Almanac,

and the *necessity* of referring to *foreign* ephemerides for what *ought* to be contained in our own *. Surely it is of some importance to foster and keep alive this laudable spirit in our navy, and to afford them every means for multiplying observations, which in many cases may be absolutely necessary for the safety of their vessels; and which, at all events, must inevitably tend to the promotion not only of astronomy but also of geography, hydrography, and navigation.

Besides, it frequently happens that, during these expeditions, a temporary landing is made at places either wholly uninhabited, or whose positions are but very badly determined. It is therefore desirable that every facility should be given for obtaining the longitude and latitude of such places in the most expeditious and correct manner; otherwise one great object of the voyage is lost: and the more these means are multiplied, the more likely are we to obtain a favourable result to our enquiries.

This subject in fact is of so much importance in a national point of view, whether we consider it in its relation to the safety of our navy or the scientific honour of the country, that I trust the subject will attract the particular and serious attention of the Government. Indeed, it might be a fit subject of enquiry, in either House of Parliament,

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* Witness the remarkable fact mentioned by Mr. South, that Capt. Smyth (whilst employed by the Admiralty in surveying the coasts in the Mediterranean) was obliged to refer to *foreign* ephemerides for information which was *not to be found* in the Nautical Almanac. To which may be added, that when the Expedition to the North Pole sailed in 1824, a Society furnished Capt. Parry with their copy of the *moon-culminating stars* (published by the Danish Government) for the purpose of making observations for more effectually determining the longitude of such places as he might visit in his adventurous voyage.

whether the funds appropriated (from the *public purse*) towards the formation and superintendance of the Nautical Almanac might not be made more effective than they now are: whether a much better work, at a much less expense, might not be produced: and whether in fact it might not even be made a source of revenue. The annual sale of the Nautical Almanac is about 7000: but the combined sale of all the other almanacs is nearly a MILLION copies: and many of these (*risum teneatis*) are not much inferior to the *present state* of the Nautical Almanac. It is, I fear, too generally supposed that those popular works are composed by men who live in garrets, and who pander to the ridiculous follies and absurd prejudices of the vulgar. This however is not the fact. The superintendants of some of those almanacs are men of high character and superior attainments; who are not only desirous of improving the works placed under their direction, by introducing therein a variety of new scientific and astronomical subjects, but also of removing the rubbish which annually disfigures some of their volumes. But they have the *insuperable* prejudices of the vulgar to encounter: and after an ineffectual attempt at such a reformation, they have been obliged to abandon it for the present, or, at least, to satisfy themselves with a *gradual* improvement*. Nevertheless the competition between these annual productions is so great, that each is

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* About nine or ten years ago the editors of Moore's Almanac began this attempt by discarding the monthly column containing the moon's supposed influence on the several members of the human body; and, as an experiment, to ascertain the feeling of the public on the occasion, printed at first only one hundred thousand copies. But the omission was soon detected, and nearly the whole edition was returned on their hands, and they were obliged to reprint the favourite column. The

striving for improvement, and I believe with as much effect as the disadvantages, under which they labour, will allow. Even in their present state, however, I consider some of these works (and particularly *White's Ephemeris*) as superior, in many respects, to the Nautical Almanac: since they contain much information which our boasted national work does not (and *will not*) afford: and in some of them it is, moreover, proposed to insert, in the next and subsequent volumes, the places of the four new planets ! ! !

I may be told, perhaps, that all these works are indebted to the Nautical Almanac for a *great portion* of the astronomical information they contain. This may be partly true: but it is also equally true that they contain much that *is not* (but *ought to be*) in the Nautical Almanac. And I am assured that the superintendant of *White's Ephemeris* has long laid it down as a practical maxim never to take for granted any thing which he meets with in the Nautical Almanac. His first step is to collate most cautiously the Nautical Almanac, with the Connaissance des tems and the Berlin and Coimbra ephemerides, as well as with other similar continental publications when he can procure them: and, in every case of serious discrepancy to institute an independent computation. This is the proper mode of proceeding, in order to insure accuracy: and I think there is no doubt but that the Stationers' Company (or some other respectable body) would also gladly undertake the computation and printing of the Nautical Almanac (provided the copyright were secured to them)not only *free of every expense*

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total *annual* sale of this work by the Stationers' Company is nearly *half a million* copies; besides pirated editions of about one hundred thousand copies; and two reprints of it in France,—one at Boulogne and the other at Paris ! ! !

to Government, but even subject to the stamp duty, from which it is at present exempt. Let it but fairly enter into *equal* competition with other productions of a similar nature, and we should in all probability have a work of a much superior kind to the present one, the number of its copies would be increased, and instead of being an unnecessary and useless expense (and a *disgrace* to the nation), it might thus become a source of annual income, and a means of improving the science of astronomy. If the Nautical Almanac were made what it *ought* to be, and such as the situation of this country demands, there is no doubt but that its sale might be considerably increased. It is known that the American booksellers (who *reprint* that work in the United States) correspond with the German astronomers for the supply of additional matter, to be inserted in the annual volumes. And what is the consequence? *One* bookseller alone (and there are *several* who reprint the work) sells upwards of twelve thousand copies! I believe the *total* sale of the Nautical Almanac, in *this* country, never amounted to seven thousand copies.

Hitherto I have said nothing of the *accuracy* of the Nautical Almanac; and, as far as *arithmetical calculation* goes, I am ready to accede to the computers their due meed of praise for diligence and attention. But, there is an attention of a much superior kind required, in order "to attain "the *highest possible* degree of accuracy *," (and belonging rather to the *directors* of the Nautical Almanac than to the *computers*,) which I am not so readily disposed to grant. I allude not only to the *choice of the Tables* from which those computations are made, and to the *corrections*

* See the annual Advertisement prefixed to all the late Nautical Almanacs.

which ought from time to time to be applied, even to the best tables, in order to adapt them to the improving state of the science; but also to the *communication of that information* to those who consult the work. This plan was rigidly pursued by the late Dr. Maskelyne, when the Nautical Almanac was under his superintendence; the *best tables* were constantly sought after and adopted; and *additional equations* were supplied whenever subsequent investigations warranted such a measure. A minute account of the changes thus made, and incorporated with the computations, *was always given* in the Preface to each almanac. Such was the conduct of the *practical* superintendant; who well knew the *use of instruments*, and the true value and application of *correct and convenient tables;* and who employed his splendid abilities in aiding the enquiries not only of the astronomer, but also of the *seaman*, in *every branch* of the science: bearing in mind the well known apophthegm of Bacon, that "knowledge is power," and that it furnishes us with an increasing fund, on which we may at any time draw, in case of need. And who, moreover, *was not paid* for this branch of his labours.

Let us now see whether we bettered our condition when it was placed in other hands, and under a new direction: and subject, moreover, to *a charge of £300 a-year for its superintendance* *. I fear not:—for, at the very threshold

* I wish it to be understood that I have no *personal* allusions in view, in any part of these remarks: it is the *system* only which I attack, without reference to the individuals, who stand too high, both in character and abilities, to be affected by any observations that I may make. By the act of Parliament, constituting the late Board of Longitude, it was declared to be "highly expedient to the *interests of navigation*, and the "*honour of the country*, that the Nautical Almanac should be accurately "computed, compared, and published," and "that some person of com-

of our enquiries we find all hopes of improvement withered in the bud; since we are gravely told, year after year, in the Advertisement prefixed to the Nautical Almanac, that as far as the existing tables of the "sun and moon have "been examined, they appear to be already *sufficiently ac-* "*curate* for *every* purpose of practical astronomy." Why, so far from this being the case, there is *not one* purpose of practical astronomy for which the tables of the sun (setting aside those of the moon) are "sufficiently accurate:" and if the directors of the Nautical Almanac had ever condescended to look through a transit instrument (even of ordinary construction), they would readily have been convinced of the fact; and would soon have learned that they are not "sufficiently accurate" even to regulate a common chronometer. Indeed, the truth itself is tacitly acknowledged in the Supplement for 1829, where they have inserted Professor Airy's *table of corrections* of the solar tables for every fifth day of the year, from the recent investigations of that profound mathematician: thus virtually contradicting the bold assertion which they had so incautiously and so repeatedly made.

As to the tables of the *planetary* motions which have been

"petent skill and ability should be nominated by the Admiralty for su- "perintending, under the direction of the said Board *in general*, and "the Astronomer Royal *in particular*, the due and correct publication of "the Nautical Almanac." Under this *triple* responsibility the work has hitherto been, year after year, smuggled into the world, like an illegitimate child, without much regard either to the *interests of navigation* or the *honour of the country;* and each party has consequently been ashamed to own their offspring. It is now rumoured, however, that a new arrangement is about to be made: and, if so, it may be a fit subject of enquiry in the House of Commons whether that arrangement is likely to tend to a better result than the last.

employed, they are said to be "*chiefly* those which are "printed in the third volume of Professor Vince's Astro- "nomy, with the omission only of *some equations* which do "not materially affect the results." But, why this ambiguity and mystery? Do not the directors know precisely *which* planets have been computed from Vince's tables, and which *not?* And what *equations* have been *retained* and which *rejected?* And why are we not to be made acquainted with the fact? It is well known that M. Bouvard has published tables of Jupiter, Saturn, and Uranus, much more recent than those of Vince: and yet no allusion whatever is made to these tables; nor is it known whether any of them have ever been placed in the hands of the computers. Besides, who can doubt the propriety and even the *necessity* of stating *distinctly* the tables and authorities depended on in *every* calculation in the Nautical Almanac: and that, *not loosely*, but with *express notice* of any *equations* omitted in their use, and the *corrections* made in them. Not to do this is not only to deprive ourselves of the valuable consequences which could not but result from a *repetition and verification of the calculations* by other persons, who (from a peculiar turn of mind) delight in such computations, but likewise to *destroy all confidence* which such unreserved publicity is calculated to inspire. As to the positions of the *planets* however, as inserted in the Nautical Almanac, they are given in such a rough manner (to the nearest minute in time only) and for such long intervals, that "for any pur- "pose of practical astronomy," they might just as well have been computed from the Tables of Halley, or even the Rudolphine Tables of the sixteenth century.

The public indeed were, at one time, led to imagine that the *lunar distances from the planets* were about to be inserted in the Nautical Almanac: as they were *repeatedly* told in

the Preface to that work, that "whether any advantage "would be gained from the insertion of the moon's distance "from Jupiter, must depend on the precision of the tables "of that planet [*whose* tables? Vince's or Bouvard's?]: a "point which is *expected* to be *very shortly* determined from "*the most accurate observations.*" But, this *expectation*, like that of the Mountain in labour, terminated in a much more ridiculous way. For after amusing the public, *for seven years*, with this idle tale, the printer appears to have been ordered to erase the paragraph silently from the Advertisement; and thus vanished all at once every trace of the "short expectancy," the "accurate observations," and the "precision of the tables:" so that even the *mouse* did not appear to give a colour to this septennial parturition *.

It perhaps will hardly be credited that M. Schumacher, a few years ago, offered his *lunar distances from the planets* (which are published by the Danish Government) to the late Board of Longitude, for circulation with the Nautical Almanac: proposing to put the titles of the columns in English, and simply requiring that the Board should pay for the paper and printing. *But they declined the offer!!!*

If I were disposed to swell this list of complaints, I might

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* The Board of Admiralty, like the late Board of Longitude (for the Supplement for 1829 has come out under *their* authority), still

"Keep the word of promise to our ear,
"And break it in our hope:"

for, in the Advertisement to that volume we find that the parallaxes and logarithmic distances of the principal planets are given, because "the "*navigator* may have occasion to employ them in the determination of "his longitude by *their observed distances from the moon*, should that me-"thod be found sufficiently exact to be relied on." That is, these values are given *now*, in order to be used at the end of another official gestation of seven years.

enter into a number of minute inaccuracies that ought not to appear in a work of this kind, on which so much money is annually *wasted:* such as marking *invisible* occultations and eclipses, as if they were *visible*, and *vice versâ:*—giving the mean places of the stars, in one part of the work, *different* from what they are in another part:—inserting new tables without any explanation of their use and application:—omitting in leap year the 29th of February in the apparent places of the stars:—stating the mean places of the stars to be "deduced from the *latest* observations that "have been made up to the present time," although the very next line informs us that "from some late observations "[i. e. later than the latest] there is reason to conclude "that the right ascensions should be diminished one-tenth "of a second:"—with other things of a like kind; which, although they may appear trifling to the general reader, or to the "mere navigator," show great inattention to the arrangement of the work, and destroy that confidence and authority to which it *ought* to be entitled amongst astronomers, as published under the direction and sanction of the Government.

But I shall not pursue any further this tiresome and disgusting appeal:—an appeal which has been so repeatedly urged by others, as well as by myself, to so little purpose. Long and *loud* have been the complaints; and enough has been said to show the necessity of a reformation, if there existed a disposition to adopt it. But this country, once so distinguished in the science of astronomy, so celebrated for its artists and the superiority of their instruments, and at the same time so jealous of the productions and claims of others, now views with apathy (as far, at least, as the Government is concerned) the rapid advances that are making in the neighbouring states; and which have al-

ready left us *far behind* in *every* branch of the science, and in *every* art connected with its practical application. We see around us, on the continent, *unrivalled* artists in horology, in optics (including the art of manufacturing the most beautiful glass for optical purposes), and in the making and dividing of every kind of astronomical and geodesical instruments, and whose works are sought for in every observatory: we observe the most profound researches carrying on, both in theory and practice: we see the greatest activity in all their observatories: and, though last not least, they are now supplied with an Ephemeris *which ought to put England to shame.* These facts are too notorious to be denied: but, if those in power cannot feel for the honour of the country, or will not exert themselves for its support, little can be expected from those in a more humble station: and the evil must be left to find its own remedy.

It has been justly stated by a distinguished and much lamented philosopher of this country, that "there are some "sounds inaudible to certain ears:" and so it would seem in the present instance. There *is* a sound however, though not so *loud*, that *will* ultimately be heard,—"the still small voice" of time and reason (in common parlance yclept *the march of intellect*),—which, sooner or later, must and will bring about the reformation so repeatedly insisted on, and so anxiously desired by every friend of science. And with this "sure and certain hope" (for, come it must, at last) I now proceed to a more pleasing subject.

New Astronomical Ephemeris.

Many of my readers are probably aware that, within these few months, there has appeared at Berlin one of the most useful publications in practical astronomy that has ever yet been formed. It is an astronomical ephemeris

arranged in an entirely new manner, computed on an entirely new principle, and every way adapted to the present advanced state of this important science.

It will be recollected that, for the last fifty years, the celebrated Professor Bode conducted the Berlin ephemeris, under the title of the *Astronomische Jahrbuch*, with great credit to himself, and with great advantage to astronomy. This work, inferior to none on the subject, contained annually a vast variety of valuable information, which would probably have perished, had it not been for the interest and zeal which Bode took in every thing regarding astronomy Yet, notwithstanding the rapid strides which the science has made on the continent, little or no alteration was made in the usual columns of this publication during Bode's lifetime: but, on his death, M. Encke, who has been appointed to succeed him, determined on re-modelling the work altogether, and on adapting it to the increased and increasing demands of the astronomer. With this view he has abandoned the plan of publishing the voluminous Appendix thereto, which has generally been filled with matter that more properly belongs to a periodical journal; and which will now be transferred to the pages of Professor Schumacher's very valuable *Astronomische Nachrichten*: whilst the monthly columns of the Ephemeris will be consequently enlarged without any additional expense to the reader. On the other hand, Professor Schumacher will in future discontinue his annual *Hülfstafeln*; which will henceforth form part of M. Encke's work above alluded to. This mutual exchange and arrangement, which commences with the present volume for 1830, will be highly advantageous and convenient to the practical astronomer; who will thus have, in one volume, all the daily information he requires for the use of his observatory.

One principal and great improvement in this ephemeris is the introduction of *mean solar* time into *all* the computations, instead of *apparent* time, as hitherto adopted in every other ephemeris, except it be that of Coimbra. The articles in the ephemeris are also *much better arranged:* and the computations are more extensive, and *carried to a much greater degree of minuteness*, than has hitherto been done in any other similar work. Many *new* subjects are likewise introduced: such as *the places of the four new planets*—a list of *occultations*—a list of *moon-culminating stars*—and a variety of other important and convenient tables which are of constant use to the practical astronomer. This however will be more fully seen, by a more minute description of the work in question, which is as follows.

The ephemeris of the *Sun* is, for each month, divided into two pages; one of which is devoted to *apparent* noon, and the other to *mean* noon. The former page contains, besides the days of the month and the days of the week, the mean time (to *two* places of decimals in the seconds), the right ascension of the sun (to *two* places of decimals), and its declination (to *one* place of decimals), together with the equation of time (to *two* places of decimals), and the logarithm of the double daily variation in the declination,—a quantity extremely useful in determining the time from altitudes of the sun. The latter page contains the right ascension of the meridian (to *two* places of decimals), the longitude of the sun (to *one* place of decimals), its latitude (to *two* places of decimals), the logarithm of the radius vector (to *seven* places of decimals), and the semi-diameter of the sun (to *two* places of decimals); together with, not only the days of the month, but likewise the number of days elapsed from the commencement of the year.

The ephemeris of the *Moon* is also divided into two

parts; but as the computations are made for every twelve hours, each month occupies four pages. These contain the moon's longitude, latitude, right-ascension, declination, parallax, and semi-diameter, (each to *one* place of decimals,) for *mean* noon, and mean midnight. There is also given the mean time of the moon's upper and *lower* culmination, (to the *tenth* of a minute in time), as well as her right ascension and declination (to the tenth of a minute in space); together with the time of her rising and setting, the time of her changes, and the time when she is in perigee or apogee.

At the end of this joint ephemeris of the sun and moon, there is given for every *tenth* day of the year, the apparent obliquity of the ecliptic, the parallax of the sun, the aberration, and the equation of the equinoctial points (each to *two* places of decimals); together with the place of the moon's node (to the nearest *tenth* of a minute).

Then follows an ephemeris of each of the *Planets*, including the four newly discovered ones. The places of Mercury and Venus are computed for mean time at *noon* for every *second* day, and the remaining planets for mean time at *midnight* for every *fourth* day of the year. The columns contain the heliocentric longitude and latitude of the seven principal planets (to *one* place of decimals in the seconds), the geocentric right ascension (to *two* places of decimals), and the geocentric declination (to *one* place of decimals); the radius vector, and the logarithm of the distance from the earth (each to *seven* places of decimals); together with the time of their rising, setting, and passing the meridian. The computations of the four newly discovered planets are not so minute, except at the time of their opposition; for which period a separate ephemeris is given of the position of the planet for *every day*.

We have next an ephemeris of the time of the eclipses of *Jupiter's satellites* (to *one* place of decimals); to which is subjoined (for *each* satellite) a table for computing with the greatest accuracy, not only the configurations at any moment, but also the position of the satellite with respect to Jupiter at the time of its immersion or emersion. At the end of these tables, we are presented with another ephemeris (computed for every fortieth day) of the apparent position and magnitude of Saturn's ring.

After this comes a table of the mean places (for 1830) of 45 principal stars; the right ascensions to *three* places of decimals, and the declinations to *two* places of decimals. From these are computed and given for every tenth day of the year, the apparent places of the same stars (to *two* places of decimals), with their differences. And we have also the apparent places, for *every* day in the year, of α and δ *Ursæ Minoris*. To the whole of which are annexed formulæ for determining the amount of the diurnal aberration. Following these is given a table of the constants A, B, C, D, for every tenth day of the year, for the purpose of determining the apparent places of any other stars. It should however be remarked, that these letters do not indicate precisely the same quantities as are so designated in the catalogue of the Astronomical Society: and it should also be noted, that the numbers are adapted to *sidereal* time. There is however another table subjoined, for the use of those who are disposed to adopt *mean solar* time in these computations.

Next follows a particular account of all the solar and lunar *Eclipses* that will happen in the course of the year; together with all the necessary elements for computing them. This is followed by three pages of the *principal phænomena* of the planets: such as the time of their perigee

or apogee, their perihelion or aphelion, their greatest elongation, their greatest latitude, their conjunction and opposition, their passing the nodes, their greatest brilliancy, their proximity to the moon, and occultation thereby, &c.

Then follows a list of *moon-culminating stars*, occupying seventeen pages; and (which is equally valuable) a list of the *occultations* of all the stars down to the 7th magnitude inclusive, that will take place in the course of the year; wherein the mean time of the immersion and emersion of the star (to the nearest tenth of a minute) is given, as well as the angle from the vertex of the moon at which the phænomenon will take place. To this list is subjoined some auxiliary tables for computing the occultation more minutely, if required.

To the whole is annexed an Appendix, giving an account of the mode in which all the computations are made, and the tables from which they are derived. By this excellent plan, the observer can at any time verify any of the calculations, and detect any error which he may have cause to suspect. The *names of the computers* also are given, which must materially tend to insure the accuracy of the work.

Such is the substance of the publication here alluded to, which has just reached this country, and which does so much credit to its distinguished conductor. It should be hailed as the harbinger of a general improvement in the mode of arranging and forming the ephemerides of different nations. And although it is mortifying to reflect that this country cannot (or will not) maintain its pre-eminence in these and other scientific subjects, yet we should be grateful for information wherever it can be found, and hope that we may be able eventually to emulate the splendid example which has thus been set us. M. Encke, disdaining the trammels of former and less enlightened times, and relying on his own

excellent judgement and abilities, has nobly and boldly struck out a new path for himself, which there can be no doubt will soon be followed by every nation pretending to encourage the science of astronomy.

Indeed the present work may be considered as forming a new æra in the science; and something might now be done to place astronomy (as it ought to be) on a better footing in this country. And since œconomy is the order of the day, and has in fact been publicly declared to be one of the causes of the dissolution of the late Board of Longitude, why should we not follow up that system, by getting rid also of the whole of the expense incurred in forming the *Nautical Almanac*. This work is sold in the shops at *five shillings;* and it is said that the publisher is allowed sixpence for every copy that is sold. This, I am aware, is a less profit than usual for publications in general: but here the publisher runs no risk, and incurs no expense, or even outlay of money: I believe he does not even advertise the work. Let us suppose, however, that he is allowed a shilling for every copy: there will then remain four shillings for each copy, as a return to Government towards defraying the cost and charges on the work. This will raise (supposing the whole 7000 copies to be sold) the sum of £1400. The charge of printing and paper (even in the present expensive way in which it is got up) cannot amount to so much as £600: and there would then be left a sum of upwards of £800 to defray the charge for computations; which I presume does not amount to any thing like that sum.

But, by a *little* attention to œconomy in paper and printing, and by a *great deal* of improvement in the work itself, I have no doubt the sale might be increased to ten, or even twenty thousand copies: in which case, the *profit* would be

manifest and considerable. And if the computers of the Berlin Ephemeris could be induced, for an adequate remuneration, to adapt their calculations to the meridian of Greenwich, when they are computing their own ephemeris, a further and very considerable portion of the charge which now attaches to the Nautical Almanac would be saved: and we might thus have an excellent work, at a very moderate expense, which would be both a saving and an advantage to the nation.

THE END.

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