

## ON A NEW METHOD OF CORRECTING LUNAR DISTANCES FOR PARALLAX AND REFRACTION.

BY WILLIAM CHAUVENET,

PROFESSOR OF MATHEMATICS IN THE U. S. NAVAL ACADEMY.

[Communicated by Lieutenant DAVIS, Superintendent of the Nautical Almanac.]

IN the year 1832, BESSEL gave, in the *Astronomische Nachrichten*, a new solution of the problem of finding the longitude by lunar distances. He demonstrated the errors of previous methods, and, taking a view of the problem wholly different from that taken by all who had before investigated it, he proposed formulas by which, with a particular disposition of the ephemeris, a perfectly accurate result could be obtained. An ephemeris arranged upon his plan was immediately prepared and published by SCHUMACHER, together with tables and practical directions for facilitating its use at sea;\* and in the hope of reaching British and American navigators, all the rules were given in the English language. The experiment, however, was unsuccessful, and after the ephemeris had reached its third year, it was abandoned. This failure is to be ascribed chiefly to the nature of BESSEL'S computation, which, besides being considerably longer than those in common use, required more skill in the management of trigonometric functions than was generally possessed by navigators. As delivered by its author, the method seemed simple enough to the mathematician accustomed to considering the varying signs of his functions; but when it was reduced to a set of practical rules, dispensing with a consideration of those signs, it became embarrassing by the

multiplicity of its cases. But the solution is the only complete and perfect one that has been given, and cannot be wholly laid aside. It is to be hoped that an ephemeris adapted to this method may again be established, if not for the use of all navigators, yet for those (and they are not a few) who possess the requisite skill, and who set a value upon precise results.

In the mean time I have found that something could be done towards perfecting the common methods without changing the form of the ephemeris, and without introducing any processes of a kind not familiar to practical men. The method I have proposed\* is hardly more laborious than the simplest of those in common use, while it attains to that extreme precision which is required when we wish to get from our observations all that they are capable of giving. It is proper to observe, however, that BESSEL'S method, dispensing with the observation of the altitudes, is to be preferred for observations at night, when it is usually difficult and often impossible at sea to measure altitudes on account of the obscurity of the horizon. But with lunar distances from the sun, the object most frequently employed, there is no difficulty in obtaining the altitudes, so that for these, as well as for twilight observations of planets or stars with the moon, a short and accurate method of employing the common ephemeris is still desirable.

\* *Distances of the Sun and the Four Planets, Venus, Mars, Jupiter, and Saturn, from the Moon, calculated according to Mr. Bessel's Method, etc.*, (for the years 1835, 1836, 1837), by H. C. SCHUMACHER. Copenhagen, 1834 - 36. — *Auxiliary Tables for Bessel's Method of clearing Lunar Distances.*

\* I gave a brief sketch of this method at the meeting of the American Association for the Advancement of Science in August last, but without the mathematical investigation which it is the object of the present paper to supply.

(To be continued.)

## CONTENTS.

- ON THE CONSTITUTION OF SATURN'S RING, BY PROFESSOR BENJAMIN PEIRCE.  
OBSERVATIONS OF EGERIA, MADE WITH THE FILAR-MICROMETER OF THE WASHINGTON EQUATORIAL, BY MR. JAMES FERGUSON.  
FROM A LETTER OF PROFESSOR CURLEY TO THE EDITOR.  
NEW PLANET.  
OCCULTATIONS OF STARS OBSERVED AT YALE COLLEGE OBSERVATORY, NEW HAVEN, BY MR. FRANCIS BRADLEY.  
FROM A LETTER OF MR. HIND TO THE EDITOR.  
FROM A LETTER OF DR. PETERSEN TO THE EDITOR.  
IRENE.  
ON A NEW METHOD OF CORRECTING LUNAR DISTANCES FOR PARALLAX AND REFRACTION, BY PROFESSOR WILLIAM CHAUVENET.