BROWN AND SHOOK—PLANETARY THEORY

Planetary Theory. By E. W. Brown and C. A. Shook. Cambridge, University Press, 1933. xii+229 pp.

The reviewer's lot is not "a 'appy one". He is expected to give in a brief measure of time and space a critical examination of a treatise covering several hundred pages and representing many years of investigation by renowned authors. And above all he is expected to make some contribution to the errata of the text! Realizing the un'appiness of the lot before him, the reviewer proceeds with much appreciation and with no little trepidation in an effort to summarize rather than to examine critically. And he has no contribution to make to the errata! The text already contains a page of such, contributed by experts, and that is sufficient for any volume.

When William Thomson (afterwards Lord Kelvin) and his older brother James accompanied their father on a summer tour through Germany, it is recorded that William, then 16 years of age, took Fourier's famous *Analytical Theory of Heat* for light reading. The reviewer does not recommend *Planetary Theory* for any such journey except possibly to those with Kelvin's I.Q.

"The purpose of the volume", as stated by the authors, "is the development of methods for the calculation of the general orbit of a planet". It does not aim to be a substitute for a treatise like Tisserand's or Laplace's nor does it contain detailed accounts of such classical theories as are to be found in Newcomb or elsewhere.

The mathematical processes are largely formal. Rigor is desirable when attainable, but results are much more to be desired (compare *Proverbs* on a *good name* and *riches*), particularly when the results appear to be reasonable and "useful for the prediction of physical phenomena".

Considerable portions of the volume are new, particularly the work on resonance and the Trojan asteroids.

Various forms of the equations of motion are derived in Chapter 1. For the development of planetary theory the *osculating plane* possesses certain advantages as a principal plane of reference. It is the plane passing through the sun and tangent to the orbit of the planet. Its motion, being either slow or small, affects the motion of the planet in a way which can be quite simply accounted for or neglected entirely. Two systems of coordinates may be used with the osculating plane as the principal plane of reference. Three variables are used in one system and six in the other. In the latter case the variables are the elements of the osculating ellipse. Polar coordinates are next used. The equations are then put into canonical form and also derived first with the true orbital longitude and later with the disturbed eccentric anomaly as the independent variable. The chapter concludes with the derivation of the equations of motion referred to the coordinates of the disturbing planet and also to any arbitrary plane of reference.

Devices are treated in Chapter 2 to simplify the expansions of various functions into sums of periodic terms. Lagrange's well known theorem for the