TIDAL FRICTION AND THE EARTH'S ROTATION. Editors: P. Brosche and J. Sündermann, Springer Verlag (1978), 244 pp., 81 Figs., 26 Tables, Price US $ 26.40.

Even though non-uniformity of earth's rotation and acceleration of moon's orbital motion were discovered by HALLEY and KANT around 17th Century, the significance of these results and a quantitative understanding of this important phenomena were realised only recently. The subject of tidal friction and a clear understanding of its effects associated with earth's rotation forms the subject matter of the book 'Tidal Friction and the Earth's Rotation', edited by P. Brosche and J. Sundermann.

Deformation of plastic earth under tidal stresses results in frictional dissipation which manifests itself as loss of spin angular momentum resulting in slowing down earth's rotation or lengthening of the day. It is well known that as moon's orbit expands, its orbital velocity decreases resulting in the increase of its orbital angular momentum thus conserving the angular momentum lost by the earth due to tidal friction. However, quantitative estimation of tidal friction from even precise measurement of angular momentum of moon is rendered difficult due to the superposition of various other terrestrial effects.

Detailed analysis of historical pre-telescopic astronomic observations including those derived from total solar eclipse observations indicate that the tidal dissipation is about $-(29 \pm 2) \cdot 10^{-9}$/cy. In spite of inaccuracies inherent in the historical observations, it has been possible to establish the temporal constancy of the lunar acceleration as well as the smooth variation of earth's rotation over the past 3 millennia.

Time variations introduced due to the effect of wind, atmospheric pressure, temperature, groundwater line and the tidal friction due to the oceanic currents as well as the tidal dissipation in the oceans have significant influence on the deformation of the plastic solid earth. Modern techniques which not only use atomic time and sophisticated instrumentation but also the latest developments in space technology such as Doppler satellite measurements, Lunar laser ranging technique with corner reflectors placed on the moon, have greatly helped us in obtaining a quantitative understanding of the dynamics of the earth-moon system.

The book 'Tidal Friction and the Earth's Rotation' not only deals with the historical growth of this subject, but also treats the theoretical framework as well as the use of modern techniques and the results obtained from such measurements in a fairly detailed and elegant manner. It also presents an extremely interesting treatment of paleontological evidence which can contribute to an understanding of the earth-moon system. Quantitative estimation of environment rhythms by measuring the preservable periodic growth features of organisms particularly, marine organisms such as sub-aqueous invertebrates, corals etc., can be extended back to as far as 3000 m.y. Deriving the value of numer of days in a year during the last 3000 m.y., using these techniques it has been possible to draw interesting conclusions such as—

1) the moon has been orbiting the earth for at least the 3000 m.y.,
2) there has been a gradual decrease in the number of days per year and a concurrent lengthening of the day; and
3) the decrease in rotation rate of the earth over geological time is consistent with the hypothesis of lunar tidal friction.

Thus, this book provides a total treatment of the subject of tidal friction in a fairly comprehensive manner. The book is written in a simple and interesting style and is a useful monograph for even those scientists who have only a passing acquaintance with the subject.

U. R. RAO.
ISRO Satellite Centre, Bangalore.