

Review

Geodesy by Brigadier G. Bomford.
Price 50s.

(London: Oxford University Press, 1952)

Geodesy is a large enough subject these days and covers a formidable range. The subject matter of the book under review comprises:

1. Primary triangulation and radar trilateration; Estimation of Probable Errors.
2. Geodetic astronomy and the control of azimuth by Laplace stations.
3. The measurement of height above sea-level by primary triangulation and spirit levelling; Atmospheric refraction.
4. Plumb Line deflections; Gravity and geophysical Surveys.
5. Earth's figure and crustal structure.
6. Tidal analysis, Latitude Variation, magnetic survey and Seismic prospecting.

The author sets himself the ambitious task of covering the above field in a single volume of 450 pages with the result that he is unable to give a detailed account of several important geodetic subjects and is content only with providing the necessary references.

The first three chapters deal with the field technique of Principal Triangulation, Base Measurement and their computation. The feasibility of Radar as an alternative to principal triangulation is discussed. Radar techniques are developing so fast that they bid fair to revolutionize the science of survey and geodesy in the near future.

Primary traverse only receives one para on page 63 and not many people will agree with the statement that commonsense is better than least squares for its adjustment (page 112).

Chapter IV is concerned with heights above sea level. Spirit levelling is discussed in a very condensed manner, no

guidance being given to the student as to the frequency with which the level net of a country has to be adjusted. U.S.A. has done five adjustments of their net up to date, the last one comprising 45,000 miles in U.S.A. plus 20,000 miles in Canada involving 269 condition equations. Nowhere in the book is there any mention of the levelling datum and the important considerations governing its choice. In U.S.A. datum comprises 20 stations along the coasts of U.S.A. and Canada; in England the old levelling was based on Liverpool datum, but for their new net they have chosen a more suitable datum at Newlyn.

The discrimination and definition of the errors affecting the method of levelling are most important. The author gives some formulae without proofs on page 177. These were actually brought out by Lallemand in 1912 and marked a great advance at that time as they afforded a uniform method of evaluation. But they are based on faulty hypotheses. In particular they rest on the assumption that the temperature of the air at height H above ground level is constant and is given by $T = A + B \log(H + C)$, where the constants, A , B , C are determined by observations of the temperature at three different levels. Nobody would subscribe to this assumption nowadays. These formulae are completely obsolete and would only serve to mislead the reader. It is somewhat to be regretted that the author has not seen fit to expand this chapter in greater detail as of late years great strides have been made in this subject.

The section on Mean Sea Level and the Tides is most incomplete, no mention being made of the modern tide predicting machines and the progress made in the prediction of riverain ports by taking into account harmonic shallow water constituents. Till lately the method of dealing with these ports in India rested on a time-honoured faith rather than on any scientific basis.

Much useful information is given in Chapter VII devoted to Earth's figure and crustal

structure, which is well worth careful study by even practised workers in gravimetry. The need for a uniform mesh of gravity stations for determining the form of the geoid is stressed. Gravity formulae are explained but as elsewhere the reader who would like to have a straightforward statement of facts has to put up with many cross references quite a number of which will be beyond his reach.

The modern work of Pizzeti, Somigliana, Cassini and other continental writers on gravity formulae is ignored altogether in the discussion on page 324. Indeed what is one to think of any modern treatment of gravity work which makes no mention of such workers as Helmert, de Sitter, Berroth and Jung.

The descriptions of the various geodetic instruments is the most unsatisfactory part of the book. The information given is so sketchy that it might as well have been omitted. As an example, the Frost Gravimeter is described on page 277, but the fact that the soul of the instrument is its spring which is of the zero-length variety is not mentioned.

Considering that the author is short of space and has to resort all the way to undue condensation it is surprising to see that he has devoted more than three valuable pages to the subject of Seismic sounding, which many people would consider to be somewhat removed from geodesy. One gets the erroneous impression from this chapter that Refraction methods are better or at least as good as Reflection methods. The actual fact is, that refraction methods have almost been completely superseded by the latter. The statement on p. 301 (lines 3, 4, 5) that seismic reflections are apt to be observed by the direct waves is not correct either.

On page 278 bottom the author avers that with air travel and ordinary care, Worden Gravimeter is at least as good as the pendulums. This is contrary to modern experience. At their best, pendulums can achieve an accuracy of 1 to 2 mgals and some national reference stations which have been observed by pendulums have been found to be in error by over 10 mgals. A gravimeter even on a global flight round the

world should do better than 1 mgal and a repeat accuracy of 0.1 mgal is comparatively easy.

Some notable omissions may be pointed out here. No account is given of the usefulness of occultations and total eclipses of the sun for the investigations of geoid and the figure of the earth. The solar eclipse can be utilized to increase the accuracy of world maps and bring them into a harmonious world geodetic system.

The account of precision base line measurements is confined to the routine 24-meter invar wire technique, no mention being made of the Vaissala Comparator developed by the Finnish Geodetic Institute based on the interference of light. A proposal is afoot that every country should have one or more standard base lines measured with this Comparator to ensure its triangulation being in international terms.

Earth Tides are omitted altogether and the Variation of latitude is dismissed in one para on page 384.

As mentioned earlier, the author has imposed severe limits by himself to keep the book of reasonable size and has succeeded in producing a reference book rather than a readable one. Despite the compressed style used some important aspects of geodesy are overlooked and although there is an adequate bibliography, there are some surprising omissions; in particular the tendency to ignore the contribution of continental geodesists is to be deplored as it diminishes the value of the book.

Typographical errors are comparatively few. The printing and format are excellent and the book would be valuable addition to any library. The price would be beyond the means of most students, to whom it would present a somewhat formidable aspect and who will find it hard to make much headway with it. There is no doubt, however, that the book will be of great value to research workers as it would enable them to become cognisant of what has been achieved in the various fields of geodesy. Amature geodesist will find it very stimulating and will encounter much to disagree with.

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