

USE OF HAND LEVEL AND BRUNTON COMPASS FOR
DETERMINING AND MAPPING MINOR TOPOGRAPHY

by C. K. Wentworth

In the absence of surveying instruments and without precise methods, useful mapping of small details can be achieved and made more useful by attention to certain principles and practices. If a hand level (with sighting mirror) is available it should be checked against the ocean horizon from the beach for gross errors. The observer's height to the eyes should be measured, and this value used. If horizontal distances per shot are not over 50 feet, successive hand levelling will give fairly accurate differences if care is used to mark or identify successive points. Even without a hand level, fair estimates can be made in places very near sea level if the ocean horizon can be seen and projected.

When climbing a fairly steep bluff, differences of level can be measured within 2 or 3 feet in a hundred with a hand level, and for more gentle slopes and lower features results within 15 or 10 per cent by hand level will have greater validity than an off-hand guess, and should be so described in notes. Level lines of more than 50 feet per shot can be run by hand level but will be open to question unless checked and unless the observer has unusual skill and describes the precautions taken. Two short pieces of glass tube with 25 or 50 feet of rubber tube will make a more reliable levelling apparatus for projecting long shots (see that air bubbles are eliminated).

A sighting compass such as the Brunton, commonly used by geologists and which includes a clinometer, is useful in many ways and can provide a part of the control needed in making a fairly reliable sketch map. Nearly the same results can be obtained with any compass having sighting points or a square box and with a two- or three-inch needle that swings freely. Distances can be paced on smooth ground with fair consistency if the observer makes a sustained effort to calibrate his pace. For somewhat more accurate yet rough-and-ready quadrats, or traverses, a cord or rope with 10-foot knots or paint marks is convenient and often faster than a metal tape, even if the latter be available. Calibrate the markings occasionally if the cord gets wet.

In using the compass, whether using the mirror at eye level, or viewing the needle from above, keep the box level and the needle free. Check the readings with yourself or other observers; form your own judgment as to whether your readings are reliable to 1 degree, or are in doubt up to 4 or 5 degrees. The latter may need some remedy in instrument or procedure. If the Brunton compass is used for dip or slope measurements, it should be so held that the axis of the pivot is normal to the direction of steepest slope and the sighting line should be either directly up or down that slope, or just at right-angles to it.

Regardless of what instruments or devices are used, the accuracy and utility of a map is based on use of lengths and directions of lines and of angles and triangles arranged to make the map a firm, small-scale replica of the features on the ground. The larger the map, the more it needs reference to a single long line, to one or more strong triangles, or to a well-defined grid of some sort. Any of these is preferable to a non-planned locating of minor features successively to each other. Any such sketch maps or sections should be made clear as notes by giving scale, compass directions and a legend or code of symbols; even the observer himself may forget.