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British Maps and the Metric System

Proposed Grid for Ordnance Maps

IF it were possible to make a clean sweep of British units of measurement and substitute for them the metric system, probably no one would benefit more than the surveyor and map maker. No one who has had practical experience in the use of the metric system would not prefer it to our complicated and almost barbaric weights and measures. Great Britain is the only country in Europe which has not adopted the metric system (though it was legalised in 1897). The U.S.S.R. adopted it as recently as 1927, and Japan in 1924. We should probably have had it now, had the metre not been identified with the French Revolution, which was not popular in England. The subject crops up every few years both in and out of Parliament. Select committees have discussed it, and on one occasion even recommended compulsion. But the dead weight of public opinion has always opposed every effort, and nothing has been done.

In a paper read at a recent meeting of the Royal Geographical Society and summarised in this issue (p. 196), the Director General of the Ordnance Survey, though not advocating the adoption of the metric system generally, suggested the use of metric units for a proposed map grid designed to cover all scales of the Ordnance maps.

A map grid is a graphic representation of a plane rectangular co-ordinate system. To apply a grid to any series of maps, the whole series must be projected on a single plane. The Ordnance Survey large-scale maps (the 1/2500 and six-inch) are projected on no less than forty-one planes, each containing only a single county, or a small group of counties. To apply a grid it would, therefore, be necessary to re-project the whole series on a single plane, and this would have to be done in order to carry out the Director General's proposals.

At present the Ordnance Survey large-scale maps are on Cassini's projection; that is to say, points are defined by 'co-ordinates' which are really arcs. The 'Y' co-ordinate is the perpendicular from the point on to the central meridian, and the 'X' co-ordinate is the intercept on the meridian between the foot of the perpendicular and the origin. These two arcs are plotted on the map as straight lines. The effect is to introduce a 'scale error'—or stretching of the surface—in a north and south direction, which increases progressively with the distance from the central meridian.

For the proposed new arrangement the whole country has to be brought on to a single projection; and another system, the Gauss conformal projection, based on the meridian of 2° W. would be used. In this projection there is a similar stretching of the surface, increasing with the distance from the central meridian, but instead of being stretched only in a north and south direction the surface is stretched also east and west, by an exactly equal amount. The result is that the scale, though increasing as before with distance from the central meridian, remains the same in all directions at any given point. The projection, in short, is orthomorphic.

The amount of stretch, or 'scale error', introduced by the projection—an unavoidable necessity whenever the curved surface of the earth has to be represented on flat paper—is inappreciable when the area represented does not exceed the size of an English county, but when the whole country has to be shown on a single plane this is not so. The maximum stretch in Great Britain is of the order of 1/1000, but its absolute magnitude can be reduced by the device—adopted by the Ordnance Survey—of applying a 'scale factor' which reduces the whole representation in the proportion of 2499 to 2500. On the 1/2500 map the effect of this is to make the scale along the central meridian 1/2501 instead of exactly 1/2500, and at the edges of the country about 1/2499, while the exact figure of 1/2500 occurs along two north and south grid lines each at 180 kilometres from the central meridian.

It remains to be seen whether these small variations of scale—which are, of course, far less than the normal expansion and contraction of paper—will cause any practical inconvenience. Even if this proves to be the case, the inconvenience will certainly be far less than that of the present arrangement of the 1/2500 map in numerous separate county series.

To the representation of the surface of the country thus flattened, a grid system can be applied. This is another and still greater advance in cartographic practice, for which the public will certainly be grateful when its uses are understood. The grid is—as explained—a system of co-ordinates and is formed by lines parallel respectively to the co-ordinate axes and at fixed distances therefrom. These lines form a network of squares covering the whole area of the projection, which can be applied to maps of every scale, and which provide a simple and unambiguous means of indicating the position of any and every point on the surface to any desired degree of precision.

The grid forms a complete reference system which, once it comes into general use, will doubtless be as valuable to the public for civil purposes as it was and is to the Army in war; while the rectangular co-ordinates which it represents are, of course, by far the easiest medium in which to carry out any survey operations—this is an important point.

The question then arises: What should be the size of these grid squares? This depends on two considerations: the grid unit and the scale of the map. The Director General explains that, as the Ordnance Survey publishes maps on many scales, there cannot be a grid square of the ideal size on *all*. He suggests that the unit of the grid should be selected so as to make the square suit the 1/2500 map, which is the basis of all Ordnance maps, and that the other scales must look after themselves. Practically, the choice lies between the yard and the metre, and of the two he prefers the latter, his main arguments being that the metric grid is intrinsically more suitable, and that it is less likely to require changing in future. The adoption of a metric grid now might also assist the general introduction of metric measures into Great Britain, while a grid in yards would have the opposite effect.

In our opinion the arguments put forward by Brigadier MacLeod are sound and conclusive, yet the suggestion that any assistance should be given to people who want to use the metre seems to have alarmed some writers in the newspaper press, who think, apparently, that it is the birthright of the Briton to be compelled to use as complicated a system—or lack of system—of measures as it is possible to advise. The complexity of British units is a sore handicap in trading with foreigners, who, throughout the Old World, have abandoned their native systems in favour of the metric system. The United States supports the Old Country in its resistance to change and still measures with feet and yards—but (tell it not in Gath) its foot is not quite the same as the English foot, being in point of fact derived from the international metre!

Although the introduction of metric map grids will not compel any Briton to admit the metric invader into his castle, it is by no means impossible that ere long the demands of international aviation, which insists on measuring heights in metres, may make a breach in the British front and perhaps bring about the ultimate surrender of the fortress. Some of the garrison has already gone over to the enemy. The world of science did so long ago, and industry has begun to follow suit, and would doubtless follow faster were it not that it cannot afford to leave the public behind. Whether the fortress will ever fall, and if so how and when, we will not venture to predict; but at least we may prophesy that if the introduction of a metric grid upon Ordnance maps contributes to its fall, it will prove in the long run to be not the least of the benefits which the Ordnance Survey has conferred upon the nation.