applications will require more of the undeviating interest which is so necessary for technical success but not enough of which they have received so far. They will surely receive this interest in the future, and we may hope that they will receive it from us—not only from our neighbors and children. And we may even dare to hope that the success may be so overwhelming that the first application of nuclear energy will appear just as insignificant, in comparison, as the first and still most efficient heat engine, the cannon, is in comparison with our generators of electricity and industrial power.

What Is a Map?

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SOME YEARS AGO ISAIAH BOWMAN, in a consideration of "Commercial Geography as a Science" involving "Reflections on Some Recent Books," propounded a conundrum as follows: "Q.—When is a map not a map? A.—When it has neither scale nor coordinates" (*Geogr. Rev.*, 1925, **15**, 285–294).

In the light of a regenerated interest in maps among both geographers and the general public, Dr. Bowman's comment has added significance today. Here and there American geographers, consciously or unconsciously, have exhibited a fault common in British circles—failure to provide either scale or coordinates, or both, for drawings which they designate as maps. There may be justification for a portrayal of a portion of the earth's surface without scale or coordinates on the grounds that the objective is not the orientation of any part of it with respect to the earth, but rather a presentation of a chart which will reveal certain general relationships within the limits of the area shown. For example, one might draw a sketch to show a road pattern or a succession of stream meanders, not with the idea of enabling the reader to measure distances or to determine the location of the respective elements upon the earth's surface, but rather for purposes of exhibiting certain characteristics of the phenomenon itself, irrespective of its relation to the earth. Such diagrams may serve their purposes admirably, but, lacking scale or coordinates, they hardly reflect the fundamental basis of a map; hence, they are not entitled to the designation *map*. If an individual wishes to apply the term *map* to these various drawings because that word is more convenient or more appealing than another but recognizes the incorrectness of so doing, he can protect himself by indicating his deliberate substitution to be a matter of convenience. This type of action can be illustrated in the case of the reciprocal use by some persons of the names Russia and USSR. They announce the fact that they mean the USSR whenever they say "Russia."

It may be trite to record the fact that man from very early times has been interested in making a graphic recording of the surface features of the earth. He recognized time and distance, and long struggled with the problem of measuring them. He was intrigued, first, by their relation to the nature of the earth as a body of some kind upon which man struggled for an existence and to the earth as a planetary body. Not long after he ventured out of sight of land or traversed considerable distances overland, he was moved to find safer ways of travel than dead reckoning or the marking of fixed reference points as momentary guide posts. As is now familiar to all of us, he ultimately solved many of these perplexing problems as he accumulated factual data relative to the nature of the earth itself, the characteristics of the solar system, and the universe in general.

Some geographers argue that many early representations of the earth showed neither scale nor coordinates yet have been designated as maps. The use of the term *map* in these instances, however, has probably been "complimentary," in the sense that the ignorance of the times was no fault of the peoples and that, had there been an adequate knowledge of the sphericity of the earth and of the measurement of distance, the fundamentals of scale and coordinates would have been brought into play. The ancients did ultimately lay the foundation for the assignment of 360° to a circle and the use of heavenly bodies to fix places upon the earth. Eratosthenes (about 275–196 B. C.) succeeded in securing some such data as we now demand as essential characteristics of maps, and used them. Ptolemy (90–168 A. D.) did likewise, but there were others who did not, either because they were unfamiliar with the work of their predecessors or had no confidence in their mathematical philosophies. The significance of the map for measurement

purposes was well put by Eckert (*Bull. Amer. geogr. Soc.*, 1908, **40**, 344–351) when he said:

> To test the quality of a map is to determine how well it has solved the geometric problem imposed upon it of reproducing constructively the distribution in space of geographic objects. Due allowance should be made . . . for the scale and purpose of the map as these determined the number and extent of geographic features to be represented on it.

Eckert also gives emphasis to Hermann Wagner's attitude toward maps when he states that "one of the principal domains of geography is that of measuring. Measurements are in many cases best made on maps."

Geographers agree that a map is a graphic representation upon a plane of the earth's surface or some part of it for purposes of enabling a reader to orient himself with respect to certain characteristics or areas of the earth. As such, it is a mathematical expression revealing distances, areal dimensions, locations, and directions. Perhaps the latter statement is redundant, for a draftsman producing a map must employ scale and coordinates to do so, and accordingly a map automatically offers the data just cited. *How* we use a map, of course, is not open to prediction, nor does it detract from the definition of the term *map*.

There are geographers who say that some drawings are merely "sketch maps" intended only to illustrate a few local relationships and that their mathematical aspects are unnecessary in the particular situation. If this be so, then the portrayal under consideration should not be described as a map but rather as a diagram or perhaps a chart. When neither scale nor coordinates are shown, about the best we can say for a drawing intended to represent some portion of the earth's surface is that it "floats." Although the earth as a planet may "float" in space, certainly its parts are not independent; all are integrated to constitute the whole body. The absence of coordinates seems to imply that the author of the so-called map expects the reader to provide such orienting facilities out of his memory or his possible personal familiarity with the area. For example, as these words are being recorded the writer is looking at a "map," in an excellent book, which shows the distribution of oil fields in the Caribbean region. There are no coordinates, and there is no scale. The distribution of the data delineates a pattern within the area, and if that is what the authors wish to reveal, the objective is attained. But for the reader who might care to determine distances between fields, or distances in relation to other areas of the drawing, that is impossible. Neither can the reader determine the latitude or longitude of any position in the area. Surely this drawing floats.

The indifference of some geographers to the revelation of scale and coordinates as indispensable parts of maps and in some instances their aggressiveness in arguing for the omission of these essentials is difficult to appreciate. If geography is entitled to be classified as a science, then surely a major quality must include the element of measurement. Although a map in itself is not geography, but rather a mathematical expression, there seems to be general agreement among geographers that it is basic to the science. Accordingly, it would appear that geographers cannot condone the application of the term "map" to a drawing that does not reveal at least one set of coordinates with scale or, if scale be omitted, sufficient sets of coordinates to make possible the calculation of scale. They should not tolerate as an instrument of their science any presentation purporting to be a map which does not incorporate coordinates and in most circumstances, scale as well, unless some satisfactory explanation is made for the omission.