Ethnographic Mapmaking: Part 1—Principles

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Ethnographers often overlook the importance of space in people's lives. When ethnographers make maps, they often lack key information on scale, orientation, and dimension that is essential for understanding what a map represents. The authors outline basic principles of mapmaking and demonstrate how easily maps can be made under field conditions. If ethnographers take the short amount of time to make decent maps of human cultural behavior, the crucially important spatial dimension of people's lives will not be lost.

Guides to ethnographic research note the critical importance of mapmaking: "Maps and plans of the area under investigation are essential to a clear understanding of the economic and social life of a people," such as "small-scale sketch maps of the whole area and plans (large-scale maps) of small areas" (A Committee of the Royal Anthropological Institute 1951:47). Our concern in this article is with large-scale maps of relatively small areas.

Most maps one can buy are small scale, perhaps 1:25,000, where 50 millimeters (roughly 2 inches) on the map corresponds to 25,000 × 50 mm, or 1.25 km (a little more than 3/4 mile) in the real world. By large-scale maps, we mean scale drawings with a ratio of 1:100 or so, that is, where 50 mm on the map corresponds to 5,000 mm, or 5 meters (or 1 inch corresponds to 100 inches). Large-scale mapping is best suited to the recording of house sites, camps, or a few structures at a religious or perhaps food-extraction site. In this age of Global Positioning Systems and laser/computer technology, mapping can be very easy and precise. However, the average ethnographer still lacks access to these sometimes expensive and delicate technologies and is left with only pencil, paper, and his or her own wits. We argue that much valuable information can be preserved with such traditional, if rudimentary, tools.

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THE SIGNIFICANCE OF SPACE

People's economic lives are affected by the location of resources, the areas where tasks are performed, or where exchanges take place. The social lives of people include where they sleep, where they congregate for conversation and decision making, who sits where at social functions, and the geographic location of social groups in the wider environment or residential unit. People's religious lives take place in churches, temples, and a variety of sacred locations, often defined by their auspicious and unusual location in a landscape. The relative placement of structures and objects is important in worship, whether it is the placement of elements in a Navajo sand painting, the placement of sacrifices on an Aymara altar or *mesa*, or the sacristy in a Roman Catholic church. Finally, even people's biological lives are heavily affected by space, since mates are most often selected from among those nearby. In short, space matters to people, so it should to anthropologists.

Edgerton and Langness (1974) noted that "the anthropologist should attempt to locate people in space" (p. 29), including groups and many other social or culture traits (e.g., see Harold Driver's [1961; Driver and Massey 1957] trait distribution maps across native North America). For instance, Alan Sandstrom (1991:168-73), described how, in his study of Nahua villagers in Mexico, he was able to discover a particular type of patrilocal residence pattern by using maps. The benefits of maps are many, and as we will describe, they can be made fairly easily and quickly with only rudimentary tools.

PRINCIPLES OF MAPMAKING

Cartographers have developed a number of canons for proper mapmaking, and anthropologists (especially archaeologists) have adopted these for the consistent and acceptably accurate recording of spatial information. We will focus on accuracy, orientation, scale, datum legend, and measurements to illustrate these principles. In this section, Part 1 of "Ethnographic Mapmaking," we will discuss the principles behind these topics. In Parts 2 and 3, we will illustrate their application and discuss practical difficulties a researcher is likely to encounter in the field.

Accuracy

There is no completely accurate measurement of any phenomenon, so an ethnographer must make a value judgment on just how much accuracy is necessary to capture the relevant information for a particular ethnographic phe-

nomenon. For instance, if one is measuring the placement of objects on a ceremonial altar, the precision of one's measurements should be within a centimeter because inaccuracies of a few centimeters could radically alter the relative placement of objects on an altar and therefore misrepresent the altar's appearance. On the other hand, if one is mapping a corral in which animals are being sheared or a weir where fish are being caught, being within a meter of the actual measurement should still capture the relative placement of activities. In the end, anthropologists must decide what degree of accuracy is necessary for representing particular human activities in space.

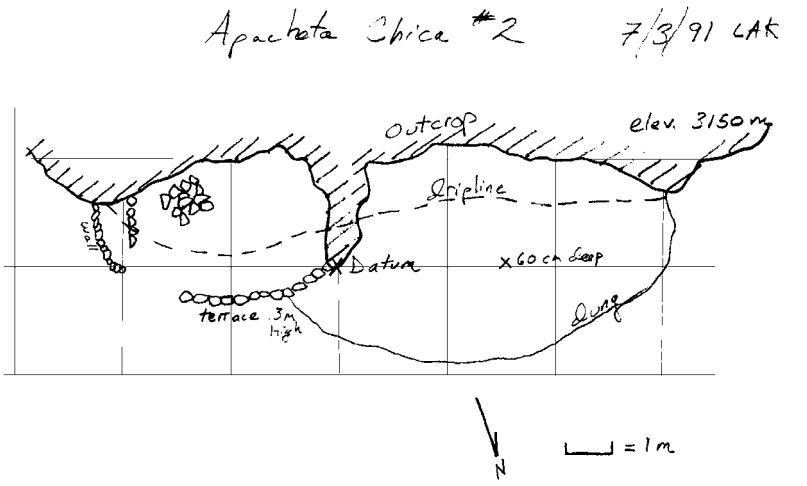
Orientation

The orientation of a map to true or magnetic north is also an essential feature of a map. Knowing the orientation is an important part of knowing where the land mapped sits in real space. Anthropologically, orientation cannot be ignored because so much human social and economic activity is oriented north to south and east to west. For instance, Navajo traditionally build their hogans pointing toward the east, and Andean altars typically point east. Orientation is noted by drawing a north arrow somewhere on the map as in the sketch map of an Andean herder's camp in Figure 1.

Scale

Every source we consulted was emphatic about the importance of a scale on all ethnographic maps. "All maps and plans should be provided with an indication of scale, orientation, legend and if possible the latitude and longitude of some given point on the map" (A Committee of the Royal Anthropological Institute 1951:47). In spite of regular warnings by, for example, Crane and Angrosino (1992:38–41) about the importance of scale, three out of the four maps in their chapter on mapmaking have no scale. Their first map is the original April 1, 1929, sketch map by Raymond Firth of Tikopian taro gardens in Rakisu; the second is the same area as of August 5, 1952, by Firth and J. Spilius (see Firth 1959). The third map, by Maria Jorrin, a student of archaeology, is of a Mexican coastal village. The fourth, an adaptation of a professionally produced map of Tripoli, Lebanon, is the only one that has explicit scales in meters and in miles. These examples show that it is very easy to overlook providing a scale. The ethnographer becomes so familiar with his or her map that the scale becomes obvious, and overlooking the fact that it is missing seems to follow naturally. Unfortunately, the reader is left without a clue.

FIGURE 1
Apacheta Chica Number 2



Lowell Holmes, in his introductory text, also has a brief section on maps. He presents three ethnographic sketch maps. The first is from his own fieldwork in the Samoan village of Ta'u. It contains an explicit scale: about .5 inch on the map equals 200 yards in the village (scale 1:14,400). The next two maps are the same two maps of Tikopia that Crane and Angrosino (1992) use, again without scale (Holmes 1965:338, 340). We have consulted several ethnographic source books, and it is relatively rare to find maps with explicit scales.

Scales come in two forms: proportionate and graphic. Proportionate scales state the scaling in terms of how many units are represented by one unit on the map. For example, 1:100 means that 1 inch on the map equals 100 inches in the real world. At the least, a proportionate scale is required for a useful map. However, should the map be enlarged or reduced, a proportionate scale would no longer be accurate. This issue is especially important to consider today when so many graphics are digital and easily loaded into documents, then enlarged or reduced to fit a space. The alternative graphic scale is more flexible. In a graphic scale, you simply draw a line depicting what a particular distance on the map equals in real space (see Figure 1). Such a scale not only conveys the scaling information necessary for an intelligible map,

but, as a map is reduced or enlarged, the scale remains true relative to the size of the map. Whenever possible, a graphic scale should be used.

Datum

Before mapping, one must choose a datum, or reference point, that anchors all other measurements on the map, and such a datum should appear on the map. Ideally, such a point should be an obvious and permanent feature of the landscape that others in the future could locate. For instance, the rock outcrop in Figure 1 provided an ideal datum point. If possible, the elevation and longitude and latitude of this point should be determined. Realistically, exact longitudes and latitudes will not be available, and only approximate elevations (inferred from topographic maps or measured on altimeters) will be available. A decent altimeter will cost less than $100. If an obvious and permanent feature is not available for a datum point, one should choose the most obvious and most permanent feature available.

Legend

Only the simplest maps where all features can be labeled on the map (such as Figure 1) can do without a legend. If any symbols are used for rivers, pathways, rock outcrops, houses, latrines, and so on, then a legend in which each of these symbols are listed and described is necessary. This is simple enough yet, like scale, simply enough overlooked by the ethnographer who is intimately familiar with his or her own mapping system.

MEASUREMENT

Mapping requires eventual measurement of some phenomenon on the ground, literally. Here is where the real work of mapping takes place. In Part 2, we will address exactly how to measure distances. However, not every distance can or should be directly measured. In this section, we present methods using simple trigonometry that will expedite and provide checks on one's field measurements. The first method is based on triangulation. The second related approach involves using squares.

Triangulation

Triangulation requires making linear measurements on the ground (covered in Part 2) and measuring angles. Measuring angles with great accuracy

requires sophisticated equipment such as a transit. Approximate measurement can be made with a compass for orienteering. These devices (we recently bought an accurate plastic model shown in Figure 2 for less than $10) are adequate for measuring degrees but are not sufficiently accurate to measure fractions of degrees. However, the measurement of the angle formed between two known distances, even an approximate angle, is unavoidable if the measurement or pacing of the third distance between two known points is impossible or very difficult.

The compass in Figure 2 has a sighting device. To measure the distance between two points whose distance from an initial point of measurement is known, one must do the following:

1. Select an initial fixed point (Q in Figure 3b) for the angle measurement carefully. The location of this point should be determined by its relations to other features of the site and the two points (P and R in Figure 3b). The distance from Q to P and Q to R must be known. The unknown distance is between P and R (dotted line in Figure 3b).
2. Point the compass to the magnetic north.
3. Then, sight point P and turn the compass dial to the magnetic north and measure the angle between the magnetic north and P. Record the angle.
4. Repeat the measurement of the angle between the second point R and magnetic north. Record the second angle.
5. Finally, subtract the smaller angle from the larger. (Should the magnetic north fall between the two points, add the angles.)

This gives one the angle between the two points P and R from the fixed position Q whence the angle measures were taken. The distance between the two points P and R is most easily determined by graphing. In Figure 3b, if the distances a (QP) and b (QR) are known and the angle A is measured with the compass, then the length of the line between points P and R is easily determined by drawing the lines and angles to scale. It is also possible to calculate the length of the line between P and R with the following trigonometric formula (which is also called the Pythagorean Theorem for nonright triangles, or Law of the Cosine):

$$\text{(i) } PR^2 = QP^2 + QR^2 - 2xQPxQR \times \cos A$$

Today, many calculators can solve trigonometric formulas. Be careful that the cosine is calculated with angle measurements in contrast to radians or grads (other measurements of angle). This will be indicated on the calculator.

FIGURE 2
A Simple Compass for Measuring Angles

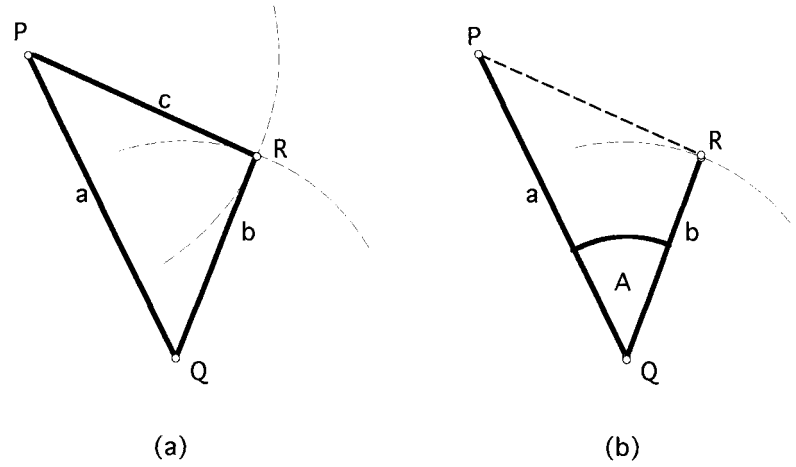
Comparing the graphed and the computed distance should serve as a double check on the accuracy of the procedures.

In triangulation, a map is constructed from a series of triangles linking identifiable features of the site (see Figure 3). There are two ways to construct a triangle:

1. when the lengths of all three sides are known (see Figure 3a) and
2. when the lengths of two sides are known as well as the angle between them (see Figure 3b).

If we know all three distances (see Figure 3a), from P to Q (PQ), from Q to R (QR), and from R to P (RP), then a triangle is completely determined and we can construct an unambiguous map from such triangles. Alternatively, if the distance in Figure 3b between points P and Q is known and the distance from Q to R is known, we must determine the angle A between the two sides to construct an unambiguous triangle in our map.

FIGURE 3
Two Kinds of Triangulation

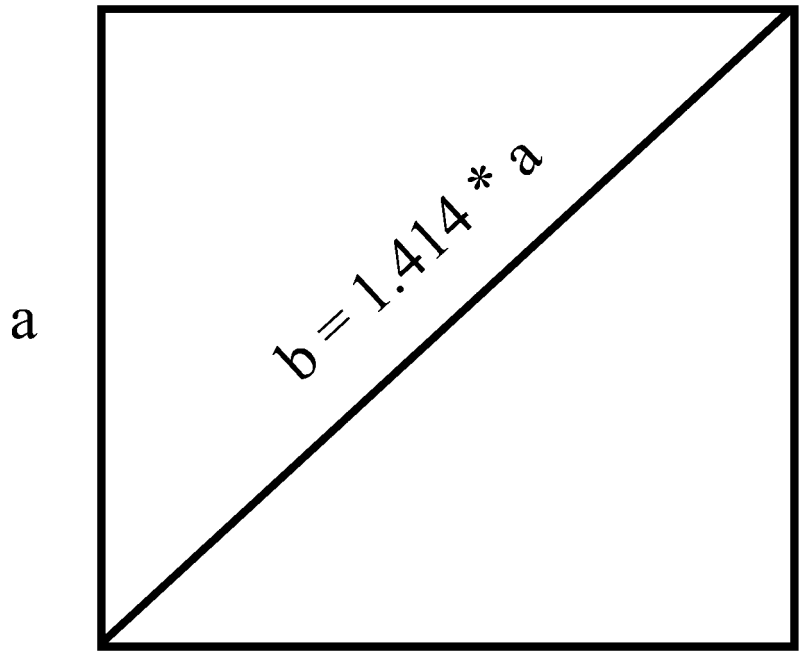


The major point of simple mapmaking is to divide the area to be mapped into triangles with easily accessible corners. Keep the need for angle measurement to a minimum. It should be reserved for distances that are impossible to pace or measure with a tape measure. Our overwhelming preference is for triangles where all three sides can be measured by pacing or with a measuring tape. Measuring the angle between two known distances is more complex and, at best, an approximation with simple instruments such as an orienteering compass.

Square Measurement

An additional check on distances, orientation, and angles is to pace off baselines oriented north-south and east-west using a compass. Then, squares can be paced off and checked with the following rule. The diagonal connecting two corners of a square should equal the length of one side of a square times the square root of 2, or 1.414 (see Figure 4). Notice that the diagonal divides the square into two right triangles. This method works well if you want to establish a grid over a site for fine mapping of objects, as in archaeological and ethnoarchaeological applications.

FIGURE 4
Diagonal Connecting Two Corners of a Square



CONCLUSION

These basic principles must be considered to make a map that conveys useful and reasonably accurate information. In Parts 2 and 3, we will describe specific applications of these principles that illustrate their use and the difficulties ethnographers may encounter. Part 2 specifically deals with use of the triangulation methods, and Part 3 details use of squares on a grid.

REFERENCES

A Committee of the Royal Anthropological Institute of Great Britain and Ireland. 1951. *Notes and queries on anthropology*. 6th ed. London: Routledge & Kegan Paul.

Crane, J. G., and M. V. Angrosino. 1992. *Field projects in anthropology: A student handbook*. 3rd ed. Prospect Heights, IL: Waveland.

Driver, H. H. 1961. *Indians of North America*. Chicago: University of Chicago Press.

Driver, H. H., and W. C. Massey. 1957. Comparative studies of North American Indians. *Transactions of the American Philosophical Society* 47:165–456.

Edgerton, R. B., and L. L. Langness. 1974. *Method and style in the study of culture*. San Francisco: Chandler & Sharp.

Firth, R. 1959. *Social change in Tikopia*. London: Allen & Unwin.

Holmes, L. D. 1965. *Anthropology: An introduction*. New York: The Ronald Press Co.

Sandstrom, A. 1991. *Corn is our blood: Culture and ethnic identity in a contemporary Aztec village*. Norman: University of Oklahoma Press.

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