in a session I was organizing (was it only last year?) at the AAG meetings in Miami. Although already booked to give a paper and as discussant (and rightly suspicious of "spreading yourself too thin" during the conference) he generously agreed to Chair the session. He was more than generous; he was downright bouncy! "Helllooooo Jeremy!" he cried when I got through to him (characteristically, his letter had left a home number for me to call). At this point, he still didn't know me from Adam.

I met him only twice, during the AAG Miami conference and just prior to that when he visited Penn State's Department of Geography as Distinguished Visitor. He prepared four original talks for his week at Penn State (including a preliminary draft of "Can There Be a Cartographic Ethics?" and work which later appeared as "Maps and the Columbian Encounter"). My notes say such things as "cartography has ridden on the coattails of science and technology," and that cartography has sought to civilize people through "the reason" of the map, and that the Enlightenment has "hijacked the history of cartography." My recollections are mixed up, however, with a party later at which he perched on my sofa, beer in hand, grinning a kind of boyish grin (as if he had just stolen a neighbor's apple and was rather pleased about it), while graduate students hovered around him or romped in the snow, where at one point I nearly expired from laughter.

Sometimes he seemed to go too far. He was fervid when it came to challenging "establishment" views. No doubt this was partly intentional, of a piece with his puckish delight in popping balloons of self-righteous hot air. From time to time, though, you got the feeling he didn't always distinguish between the challenge and the insult. To those of us

who had adopted him as our intellectual father, myself included, this was merely icing on the cake. If you reject the hegemony of the scientific paradigm, why not be polemical from time to time? It was all part of the message, plain enough in his academic writings, and plain from his active work; theory and practice coming together.

That Brian's genius and generousity has touched many besides myself was evident in a Royal Geographical Society Memorial held in London on March 17, 1992. It was sad, for obvious reasons, but in the end amazing (in the true sense of the word) to see the variety and number of people who must have memories similar to mine.

I have no doubt that Brian will continue to amaze, surprise, and even delight many more in time to come.

1. *Harley, J.B.* (1991) Can there be a cartographic ethics? *Cartographic Perspectives* 10, pp. 9-16.

2. *Harley, J.B.* (1989) Deconstructing the map. *Cartographica* 26:2, pp. 1-20.

cartographic techniques

CREATING UNCLASSED CHOROPLETH MAPS WITH POSTSCRIPT
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First introduced in 1973 by Tobler, unclassed choropleth mapping has a tortuous history in cartography. Although the technique of assigning shadings proportional to the data values made it possible to create choropleth maps without classifying the data, the method of mapping has not been widely accepted. The basic objection to

the technique is that the cartographer loses the ability to direct the message of communication (Dent 1990, p. 167).

A more practical reason, however, that the unclassed method is not more widely used is the difficulty in creating a continuum of shadings. Tobler used a coordinate plotter to create a continuum of crossed-line shadings. The introduction of the laser printer and a page description language called PostScript has made it possible to create a white to black continuum of dot shadings. A procedure for creating unclassed choropleth maps with PostScript is described here.

The Shadings
Figure 1 depicts a series of shadings that were created with Adobe *Illustrator*. A percentage ink value was assigned to each rectangle with the 'Style' command. The shadings have been perceptually adjusted using the formula by Williamson (1982):

$$W = P^{.8333} / 0.464$$

where W is the gray tone in percentage of area white and P is the desired perceived value.

value		% ink
100		100.00
90		85.32
80		73.84
70		63.32
60		53.38
50		43.86
40		34.65
30		25.69
20		16.94
10		8.38
0		0.00

Figure 1: A ten shading continuum defined with PostScript.

A desired value of 50 (P) equals a 56.14 percent white or 43.86 percent ink.

Illustrator files are in PostScript text format and can be edited with a text processor. Figure 2 is a listing of part of the file created above. The x, y coordinates that outline the middle rectangle are listed below the '.5614 g' command that defines its shading. The value was entered in Illustrator as a percentage black, but was converted to a percentage white in a decimal format (i.e., 1.0 = white; 0.0 = black) in the saved document. The decimal value associated with the PostScript 'g' command can have as many as four places. Thus, gray shadings can be defined between .0001 and .9999, making the definition of 9,999 separate shadings between white and black possible. (Whether 9,999 distinct shadings are actually produced depends upon the resolution of the printer or imagesetter.)

```
0.5614 g       ! =43.86 % ink
254 335.5 m    ! point to move to
254 353.5 L    ! points to draw to
223 353.5 L
223 335.5 L
254 335.5 L    ! end of polygon
b
```

Figure 2: PostScript commands that define a shaded rectangle.

The Base Map
PostScript files containing polygon outlines appropriate for the creation of choropleth maps can be created with *Illustrator* or *FreeHand*. Tools are available in both programs for the conversion of a scanned map to a series of polygon objects, but the process is tedious. The *MapArt* collection from MicroMaps Software (Lambertville, NJ) includes numerous polygon-based files in a PostScript format that can be used with *Illustrator* or *FreeHand*. A portion of the *MapArt* file for the state of Nebraska by county is shown in Figure 3.

The 'Note' statement includes a combination of the state (31) and county (077) FIPS codes and the name of the county. The following six coordinates outline Greeley County ('m' indicates a move; 'l' is for a line).

The Data
Computing the shading value for a polygon is simply a matter of re-scaling the data on a 0 to 100 scale:

$$P = (z_i - zMin) * (100. / zRange)$$

where, *P* is the perceived value to be used in the perceptual adjustment formula, z_i is the data value, *zMin* is the minimum data value and *zRange* is the difference between the maximum and minimum data values.

Assigning a shading value to a polygon is possible within *Illustrator* or *FreeHand* by selecting a polygon and specifying a shading value as a percentage ink. However, shadings can be assigned more quickly with a text processor. This is done by simply inserting the 'g' command along with the corresponding shading value expressed as percentage white (as computed with the perceptual adjustment formula) following the 'Note' statement. The 's' at the end of the polygon in the unshaded file must also be changed to a 'b' (last line) to have the shading take effect. The listing in Figure 4 depicts the addition of a shading value for Greeley County, Nebraska.

```
0.6543 g       !the shading value
%AI3_Note:31077,Greeley,NE
280.1552 53.6423 m
312.1679 54.1848 l
312.1679 29.2257 l
312.1679 20.5443 l
280.6977 20.5443 l
280.1552 53.6423 l
b
```

Figure 4: Greeley County with shading value

The Map
Figure 5 is an unclassed choropleth map of Nebraska depicting median housing value. The shadings were assigned using a text processor *(MacWrite II)* and the file saved in text format. *Illustrator* was used to add the lettering, legend and neat line of the map.

The Program
A utility program that assigns shadings to polygons for the creation of unclassed choropleth maps is available from the author. The program, called *PostShade*, incorporates a spreadsheet for data entry, a graphics window for the display of the map and an editor window to view the PostScript text files (Figure 6). The program works with base maps in a PostScript polygon format that include a 'Note' statement for each polygon. Once the PostScript file is opened, the area names are displayed in the first column and up to 50 columns of data may then be entered and saved as a file. A 'data' palette menu (Figure 7) incorporates a number of spreadsheet functions: 1) the display of

```
%%Note:31077,Greeley,NE         ! id of county
367.9533 385.0322 m             ! move to point
403.29 385.631 l                ! line to point
403.29 358.0805 l
403.29 348.4977 l
368.5523 348.4977 l
367.9533 385.0322 l
s                               ! end
```

Figure 3: Greeley County, Nebraska in PostScript

Median Housing Value
1990

The shadings in this map are proportional to the data value of each county.

In Dollars:

14,999.0 20,189.1 25,379.2 30,569.3 35,759.4 40,949.5 46,139.6 51,329.7 56,519.8 61,709.9 66,900.0

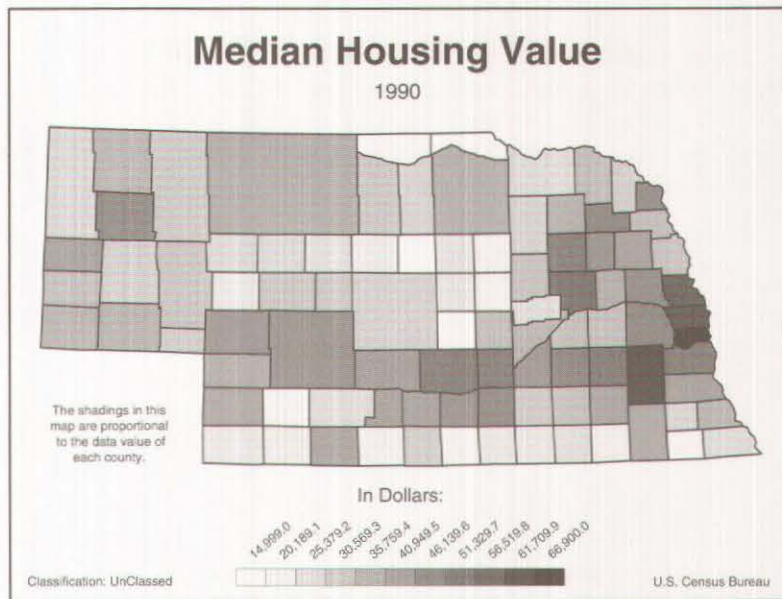Classification: UnClassed   U.S. Census Bureau

Figure 5: Unclassed choropleth map created from basemap produced with MacChoro II by editing PostScript code with a text processor.

 File   Edit   Window   Data

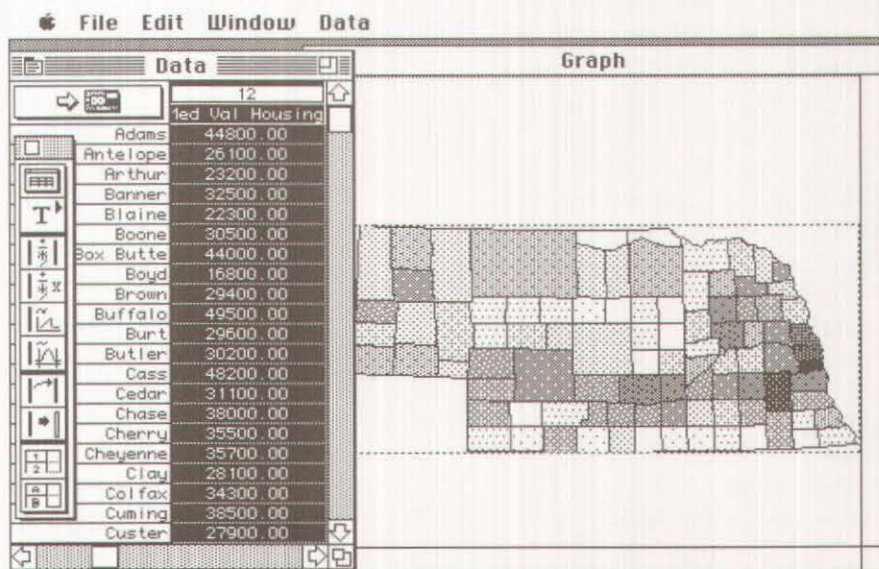| Data | 12 | Graph |
1ed Val Housing		
Adams	44800.00	
Antelope	26100.00	
Arthur	23200.00	
Banner	32500.00	
Blaine	22300.00	
Boone	30500.00	
Box Butte	44000.00	
Boyd	16800.00	
Brown	29400.00	
Buffalo	49500.00	
Burt	29600.00	
Butler	30200.00	
Cass	48200.00	
Cedar	31100.00	
Chase	38000.00	
Cherry	35500.00	
Cheyenne	35700.00	
Clay	28100.00	
Colfax	34300.00	
Cuming	38500.00	
Custer	27900.00	

Figure 6: PostShade program with map and spreadsheet windows.

the spreadsheet; 2) the addition of descriptive text for each column of data; 3) modifying a column of data through division, multiplication, subtraction or addition by another variable; or 4) a constant; 5) setting upper and lower thresholds in the data; 6) a logarithmic or square root transformation of a column of data; 7) moving a column of data; 8) deleting a column of data; and 9) the display of the numeric identifications (i.e., 31077); or 10) the character identifi-

cations (i.e., Greeley) for each separate statistical area. The unclassed choropleth map is created by selecting a column of data and the PostScript map file. The program then creates another PostScript map file that defines the shadings for each polygon and includes a legend. The lettering of the map is left to programs such as *Illustrator* or *FreeHand*.

Summary
The PostScript page description

language provides a method for defining a continuum of dot shadings between white and black for the creation of unclassed choropleth maps. The procedure outlined here involves the insertion of a PostScript statement that defines the gray value, as percentage white, for a polygon. Modification of the PostScript file in this way can be done with a text processor, although adding the legend and text elements would require a program such as *Illustrator* or *FreeHand*. A utility program is available to automate the computation of shadings, their assignment to polygons and the creation of the legend.

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without class intervals? *Geographical
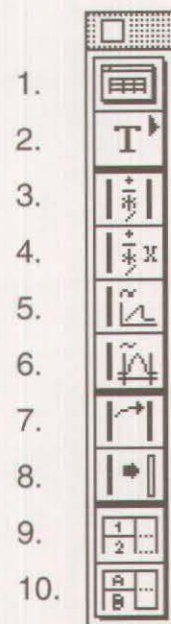Analysis* 3, pp. 262-265.

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Figure 7. Data palette menu from PostShade program.