UNITED STATES DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY

About GSMAP and GSDRAW

by

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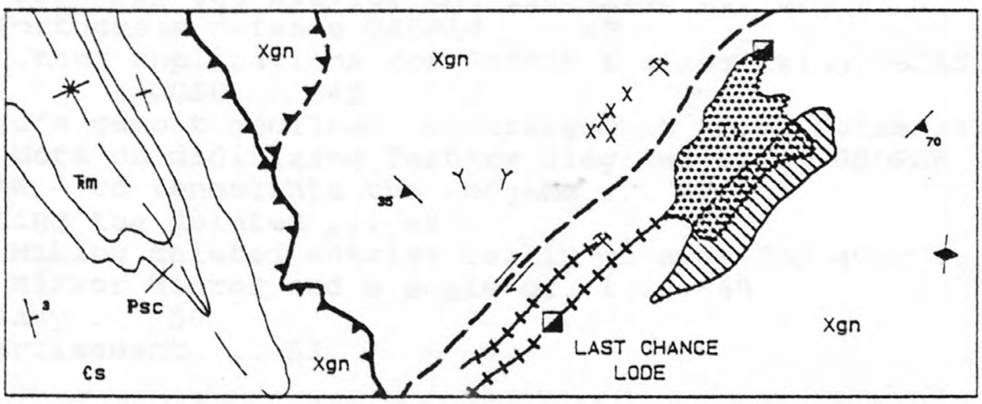

Open File Report 87-496E
1987

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Contents

ABOUT GSDRAW AND GSMAP
Introduction

The documentation for GSMAP and GSDRAW attempts a systematic description of these programs. This text is a supplement providing ideas developed during use of the programs and answering some of the common questions asked by new users at training sessions.

The first sections of this text are written for new users who have scanned the documentation, but have not yet studied it.

Later sections are written to provide ideas for old hands, explain some of the workings of the programs, and offer a few ideas on problem solving based on use of arcane aspects of the programs. The later sections assume familiarity with GSDRAW and/or GSMAP.

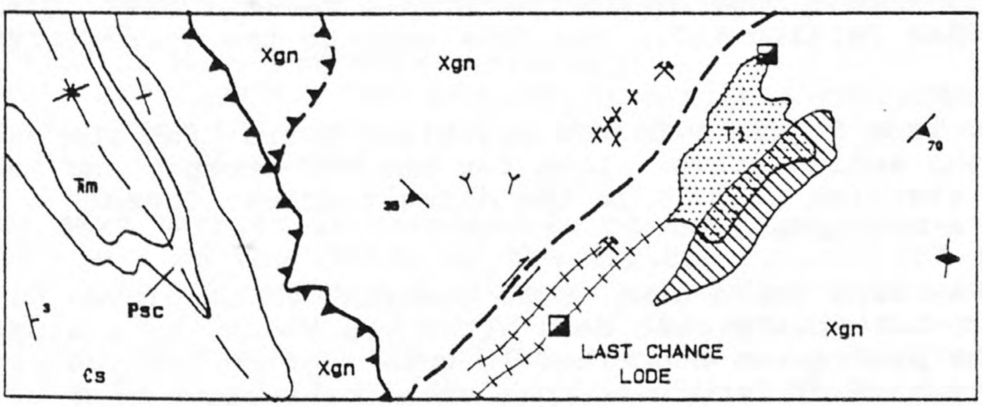

Figure. 1 Map used in exercises.

The following section would be called a Tutorial except that under that name you would expect a scholarly exposition and read only the first half page; it provides a guide through one small project, one that provides familiarity with many GSDRAW procedures. The exercise assumes availability of necessary hardware and software.

We suggest that you retrieve your copy of the *documentation for GSDRAW and GSMAP from its present position supporting the short leg of the drafting table, so that it is available for reference. Terms in this Ms marked with an asterisk are defined in the GLOSSARY. In case of emergency look them up.

First. Find a *guru and ask *him to make sure that the computer, digitizer, printer, and plotter are working, properly configured, and cabled, that the hardware is ready. If no *guru can be found, read the *documentation.

Second. Turn on the plotter, the digitizer, the printer, and the computer. See manufacturer's instructions.

Third. Boot up the computer. Do this after the plotter has been turned on. There's something about GSDRAW and GSMAP that expels you from the program immediately after making a plot if the plotter was turned on after the computer was booted up.

Next. Make a copy of the Executable release disk; Disk 1, GSMAP/GSDRAW Version 4.0. Use this copy as the disk for this exercise.

Now. Tape Figure 1 to the digitizer board. Put the exercise disk in the active drive. Look for the DOS prompt, and make sure that the exercise disk is in the default drive. Consult a *guru if there's any question.

GSDRAW is a board game. Some gambits can be played without a digitizer, but that's best done after you reach the status of a *guru. The procedures described in this section let you create a digital version of Figure 1. This exercise reviews most of the rules for the board. After completing this GSDRAW exercise you will be ready for some additional rules required in using GSMAP.

Some input for GSDRAW comes from the computer keyboard, some from the keypad of the digitizer. During digitizing sessions, the keypad is used to send instructions to the computer so you don't have to run back and forth between digitizer and computer. First, the digitizer sends instructions to the computer to prepare it to accept data. Then the digitizer is used to generate X,Y coordinates (for a point) that tell the computer where the cursor is on the board with a resolution of 1/1000 inch, and send these coordinate pairs to the computer for storage. To create a line, a string of X,Y coordinates (pairs) is sent to the computer for storage.

During plotting, the computer will tell the plotter what to do, how to connect the points that have been digitized, and how to draw an illustration according to the rules of GSDRAW.

NOW it's your turn to use GSDRAW.

*Enter GSDRAW from the keyboard (see glossary for definition of "enter" if there's any question. The computer screen will soon exhibit the *disclaimer message. Under the disclaimer text four lines of text will be displayed.

1 - Start a new data base
2 - Open an existing data base
3 - Exit
Enter choice:

Each GSDRAW and GSMAP session must begin by either starting a new data base, or by opening an existing data base. Now, let's start a new data base.

Start a data base by *entering **1**

The screen will clear, and then will prompt you to select a name for the new data base. Follow the prompts. These entries are made from the keyboard of the computer.

ENTER MAP DATA BASE NAME: For this exercise -
Enter **SPECIAL** You can use any name with 8 characters or less; please follow these directions so I don't get confused.
ENTER TITLE OF MAP: For this exercise -
Enter **EXERCISE** You can use any name with 8 characters or less. After this entry the screen will clear, and new prompts will be displayed.

The next entries in response to screen prompts are made using the keys on the cursor of the digitizer. For the first *entry of 0 to synchronize digitizer input, the cursor can be at any position within the active area of the the digitizer board (the little red light on the cursor must be on). When "entering" the corners carefully position the cross hair of the cursor over the corner, (use the + symbols on figure 1 as corners), press the 0 key on the keypad to enter the corner, move the cursor to the next corner as specified by the screen prompt,and similarly *enter the other corners in turn, as specified by the prompts shown below.

ENTER 0(ZERO)ON CURSOR KEYPAD TO SYNCHRONIZE DIGITIZER INPUT
ENTER UPPER LEFT CORNER ON DIGITIZER (use the 0 key)
ENTER LOWER LEFT CORNER ON DIGITIZER (use the 0 key)
ENTER LOWER RIGHT CORNER OF DIGITIZER (use the 0 key)
ENTER UPPER RIGHT CORNER ON DIGITIZER (use the 0 key)

These four entries define the data base corners. After entry of the fourth corhe screen will change to the Main Menu.

The Main Menu offers choices (by number) and shows the name of the current data base, if one is open. By starting data base SPECIAL, you opened this data base. This data base will remain open until you open another one (Option 2), start another one, or exit from the program.

```
                         G  S  D  R  A  W

                                        CURRENT DATA BASE: SPECIAL
                                               MAP TITLE: EXERCISE

  1  -  START A NEW DATA BASE
  2  -  OPEN AN EXISTING DATA BASE
  3  -  DIGITIZE NEW LINE SEGMENTS
  4  -  DELETE LINE SEGMENT
  5  -  RECOVER LINE SEGMENT
  6  -  CHANGE PARAMETERS FOR LINE SEGMENT
  7  -  LIST CONTENTS OF DATA BASE
  8  -  PLOT ON THE SCREEN
  9  -  PLOT ON THE HARD COPY PLOTTER
 10  -  MERGE ANOTHER DATA SET INTO CURRENT DATA SET
 11  -  COMPUTE POLYGONAL AREA
 12  -  EXIT

                                   ENTER CHOICE BY NUMBER:
```

Now let's start a digitizing session by entering **3**

The screen will clear, and you will see the following prompt.

DISPLAY PREVIOUS DATA? (Y/N)

Enter **N** (there's no "previous data in this database to display); if there was data, and you wanted to see it on the screen, a **Y** would have been appropriate. After entry of **N** the screen will clear and a high pitched tone will sound. The screen will be totally blank, waiting for you to start the digitizing sequence. When you started data base SPECIAL you also indexed the hard copy (Fig. 1) on the digitizer board to the digitizer tablet. Make sure that it doesn't move during digitizing.

Until you leave the digitizing session, all entries will be made from the keypad. The high pitched tone will sound each time during a digitizing session when the computer is ready to start receiving information about a line or some other kind of graphical entity.

You are now ready to digitize. But first read ahead a bit; then it will be time to digitize some lines, and some other kinds of graphical elements.

The computer asks for three pieces of information about each graphical entity that will be digitized. The first is for a CODE; the second is for PARA1 (parameter 1), the third is for PARA2 (parameter 2). There is a systematic description of these three in the documentation. The use of PARA1 and PARA2 is different for different kinds of graphical entities. The code requires entry of a string of three numbers; if there are less than three numbers in the code, the code string is ended using the A key; Parameter 1 requires either 6 numbers or a shorter string ended by the A key (or the A key alone (enters 0); Parameter 2 likewise requires 6 numbers or a shorter string ended by A, (or the A key alone).

A number of kinds of graphical elements are needed to draw Figure 1.

Take a look at Figure 1 to identify the kinds of graphical elements needed. 1) lines, 2) symbols like the dip & strike symbols that have an orientation that means something, 3) symbols like the mine shaft symbol that are always oriented the same way. 4) areas that are filled with a pattern (one by slanted parallel lines, the other by a stipple,5) lettering. The numbers for graphical elements in the list above match the code group numbers that GSDRAW uses for these kinds of elements.

GSDRAW uses code groups as follows: 1-99, lines, 200-299 for symbols that must be individually rotated into proper position, 300-399 for symbols where whole groups have the same orientation, 400-499 for areas that need filling with a pattern, 500-599 for alphanumeric entries. Unmentioned code groups 100-199 and 600-699 aren't needed to draw Figure 1. These groups will be discussed in later sections.

Lines, codes 1-99

For lines, the code can be any number 1-99. PARA1 and PARA2 are 0; these two parameters are included for lines only because it's easier to use three parameters for all codes than to have different numbers of parameters for different code groups.

All lines are digitized as if they were solid lines. Dotted lines, dashed lines, heavy lines, fine lines, are drawn by choosing these patterns at the time of plotting and by selecting a pen with a fine point or one with a broad point.

When planning digitizing for Figure 1, there seemed to be six different kinds of lines: the differences being ones of pattern(eg. solid, dashed), "decoration" including the railroad track pattern of the dikes and the teeth on the thrusts, and line widths (thin for contacts and others, heavy for faults).

These kinds of lines require six different codes. I used the following: code 1 for contacts, thin, solid "black" lines; code 4 for the dashed strike slip fault; code 5 for the synclinal axis; code 8 for the solid line thrusts; code 9 for the dashed line thrust; code 11 for the dikes. The lines around the stippled area and around the area filled with parallel lines will be digitized using one of the 400-499 "filled area" polygon codes (try 400 for the stippled area, 401 for the one filled with parallel lines. There is a short leader to the Psc label near the lower left corner of the diagram, but this will be drawn when digitizing the Psc label (as a leader).

When entering the code, PARA1 or PARA2, from the keypad, use the numbered keys; use the A key to end a string to complete the entry of one of these three. Numbers are entered in sequence from left to right.

Now go back to the keypad and enter 1A. A tone will sound (Concert C) indicating completion of the entry of CODE(1); next enter A; a (Concert F) will sound indicating completion of entry of PARA1; then enter A; a Concert A will sound indicating that digitizing of points can begin. These three tones rising in pitch provide auditory proof that the computer is ready for the next entry. The lowest line on the screen will show the values that have been entered, and as digitizing proceeds will show the number of the line entered, the code, the value of PARA1, PARA2, and the number of points entered. If you make a mistake at any time between starting entry of the code and closing the string of points defining the line, press the E key and you will ESCAPE back to the point of starting entry of the code. The entries made between these points will not be recorded in the database.

Digitizing lines (codes 1-99)

0 (zero key) and 1 (one key)

After entering the code, PARA1 and PARA2, put points on the board. At this stage (data entry) the keys on the keypad of the cursor have specific functions. Striking the 0(zero) key sends a pair of coordinates (X,Y) from the digitizer to the computer. This key is used for all points on a line from the first to the next-to-last. The last point is digitized with the 1 (one) key. As the computer is ready for input, move the cursor to one end of one of the fine black lines (contacts) position the crosshair precisely on the line, press the 0 key (a tone will sound; move the cursor along the line (precisely following the line with the cross hair, and at intervals press the 0 key. Pretend that this is the kids game of "connect-the-dots" and put in enough points that straight line segments connecting the points will produce a close approximation of the curved line. When you reach the end of the line, press the 1 (one) key. A high pitched tone will sound. The line just digitized will be drawn on the screen.

The high pitched tone signals that the computer is ready to receive another line code.

The D key

At this point if you choose, you can use the D ("duplicate" key to set the code, PARA1 and PARA2 to the values of the preceding line. Try this; a rapid sequence of three tones will be sounded; the final tone indicating that the computer is ready to record data points. Follow the digitizing procedure you used for the first line, and digitize another of the contact lines. Start at one end using the 0 key, follow the line with points recorded by the 0 key, and finish the line with a point recorded by the 1 key. Again, the closing of the string of points will be signaled by a high pitched tone. Now, enter code 5 (5A), then A, A, and digitize the synclinal axis. The pattern along this line will be set by the plotter later, so digitize it with a series of 0's, ended by a 1, just as if it were a solid line. Then enter code 4 (4A), then (A), (A), and digitize the strike slip fault. Then enter code 11 (11A), then (A), (A), and digitize the two dikes, following the solid line with a series of 0's and ending each line with the 1 key. The pattern of the line (solid) and the "decoration" (cross lines) will be specified during plotting. Digitize the dikes just as if they were thin solid lines. Now it's time to digitize the thrust faults. Note that one of these is shown by a solid line, the other by a dashed line. With a decoration (teeth) that plots only on one side of the line, the direction of digitizing is important. Please digitize the thrusts, keeping the teeth on the right side of the line (with respect to the direction of digitizing). The thrusts will be digitized exactly in the same manner as any line, 0 to start, a series of 0's along the line, and a 1 for an end point. Enter code 8 (8A), then A, A, for PARA1 and PARA2, and digitize the line for the solid line thrust using 0's and ending the line with a 1. Then enter code 9 (9A), A, A, and digitize the dashed line for the thrust. 0's, then a 1 to end the line. When digitizing the dashed-line thrust, the line is digitized as if it were solid, and the teeth are ignored. These refinements will be added during plotting. After digitizing,the screen will show these lines. On-screen all lines look alike; there will be no line patterns or decorations.

Remember that during digitizing a line, the zero key is used from the start until the next-to-last point, each time it is pressed, an X,Y coordinate pair is sent to the computer. Striking the one key sends a pair of coordinates from the digitizer to the computer, and also tells the computer that a string of points has been completed, and re-sets the program to the point of entry of the code.

The 2 (two) key

Now, let's use code 1, and digitize the box outline of the map. Set code 1 by entering 1 A from the keypad, then use keystrokes (A), (A) to set PARA1 and PARA2. When these have been entered, digitize the outline. start by pressing the 0 key with the cursor positioned at the upper left corner. Move the cursor to the upper right corner, press the 0 key, move it to the lower right corner, press the 0 key, move it to the lower left corner.

WAIT;

Try something different. Press the **2** key. The 2 key will record two points. One will be the point where the Cursor is positioned; the second will be the **first** point of the line. It will also close the string of points defining the line. (five points generated by three 0's and one 2). As the last point will have identical X,Y coordinates as the first (the program copies the coordinates as recorded), the outline generated will close perfectly. Digitize the last "contact" to finish entries, Code 1.

Areas (polygons require 400-499 codes)

Now let's digitize the outlines of the two areas filled with patterns. First specify code 400 (keystrokes 400). As there are three numbers, an A will not be needed to complete entry of the code, then press A, then A, to enter PARA1, and PARA2. Then choose an identifiable point on the outline of the stippled area, press the 0 key, and follow the outline with a series of 0's; at the next-to-last point on the line, a point near the initial point, press the 2 key. As you now know, this key will record a point and close the line by repeating the first point; it will also return the computer to the point where a new code can be entered. Enter 401, A, A, to specify code 401, PARA1 = 0, PARA2 = 0, and digitize the outline of the area filled with the parallel line pattern. Start at an identifiable point by pressing the 0 key, follow the outline with a string of 0's, until the next-to-last point where you will use the 2 key to record the point and add the first point to close the outline.

Individually rotatable symbols (specific codes in 200-299 series)

The completion of digitizing of the outlines of the patterned areas prompts a close look at the symbols that are used on the map.

Each of the individually rotatable symbols has it's own code; PARA1 is used to specify the angle of rotation (clockwise) from the 0^{o} position for that symbol; PARA2 is used for the angle that is to be posted for the three symbols that can be posted. For example, the strike and dip symbol near the lower left corner of the map is entered as Code 201, PARA1 = 345, PARA2 = 3 (dip & strike symbols are always code 201), the zero position for this symbol is for a N strike and an E dip. If the dip angle is 90^{o}, the proper symbol will be drawn, and no angle will be posted; if the dip is 0^{o}, the proper symbol will be drawn and no angle will be posted. Foliation symbols are specified by code 202; PARA1 specifies the rotation of the symbol (the zero position is a north strike, an east dip; PARA2 is used for the dip angle to be posted. If a 90^{o} angle is specified for the dip angle, the correct symbol will be drawn and no dip will be posted. The adit symbol is specified by code 206. PARA1 rotates it from its 0^{o} position. Enter 0 ("A") key for PARA2.

Let's run through the entries required for three of the individually rotatable symbols on the map. First, let's digitize the dip & strike symbol near the left corner of the map. The key strokes needed to enter code, PARA1, and PARA2, are the following: 201 345A 3A; during entry the now-familiar CFA tones will be heard. Then move the cursor to the precise position of the center of the symbol, and use the 1 (one) key to digitize the point. The high-pitched tone sounded will indicate that the computer is ready for entry of the code for the next entity. Select the foliation symbol at the right edge of the map, enter code 202, PARA1 of 5, and PARA2 of 90 (keystrokes 201 5A 90A), move the cursor to the center of the symbol on the map and digitize the point with a the 1 key. Next digitize the left adit (code 206, PARA1 of 10, PARA2 of 0; (keystrokes (206 10A A), then, with the cursor in proper position, use the 1 key to digitize the point. Finish digitizing the other symbols of these types. The paired arrows indicating the direction of offset on the strike slip fault require symbol code 210; you figure the required rotation (PARA1; use the A key to enter 0^{o} for PARA2. The symbol specifying the synclinal axis requires code 205, PARA 1 to rotate it from a N-S direction (PARA2 of 0 is entered with the A key.

More symbols (300-399 codes)

The 300-399 code group is used for symbols that are not individually rotatable, but which must be drawn to a specified size. These symbols can be rotated in groups (defined by code number). The code is entered as any other code would be, PARA1 is used for the symbol number, PARA2 is used to specify size (in rasters 1 raster = 1/1016 inch). The prospect symbol is symbol number 12, the mine symbol, number 13, the mine shaft symbol, number 14. 300 code symbols can either be digitized individually (using the 1 key, or in groups if a number of symbols (the same code, symbol number, and symbol size are needed. Let me suggest the key strokes that might be used to digitize the symbols on Figure 1; let's use code 300 for all of them: 300 14A 100A; move the cursor to bring the cross hair to precisely the center of the lower mine shaft symbol, press the 1 key. The high-pitched tone will sound, and a point will appear on the screen indicating the position digitized. Next, press the D key, the three tones (CFA) will sound and the screen will show code 300, PARA1 of 14, PARA2, 100: move the cursor to the other mine shaft symbol, press the 1 key; the high pitched tone will sound, and the computer will be readied to receive a code entry; use the key strokes 300, 12, 80 to enter code 300, PARA1 of 12, and a size of 80 rasters, then move the cursor to the center of one of the prospect symbols, press the 0 (zero) key, move to the other prospect symbols in turn, digitize all but the last by pressing the 0 key; digitize the last using the 1 key (to end the string) Next digitize the mine symbols, using code 300, PARA1 of 13 and PARA2 of 90. Digitize individually using the 1 key (followed by the D key) or as a group using the 0 key except for the last symbol. The principal difference in digitizing as a group or individually would come in editing: symbols digitized individually can be deleted individually; symbols digitized as a group can only be deleted as a group.

Alphanumeric entries (500-599 codes

```
(DRAW.RU)

1,"@m",
"EOT"
2,"&sc",
"EOT"
3,"\s",
"EOT"
4,"Xgn",
"EOT"
5,"Ti",
"EOT"
6,"LAST CHANCE",
"   LODE",
"EOT"
```

The information in the listing to the left under the name of the file (DRAW.RU) is from the ASCII file needed when Figure 1 is plotted. It contains information you will need to complete the digitizing of this figure. This file is included on the release disk you copied to make the exercise disk.

Codes 500-599 draw information from an ASCII file using an index number as PARA1. Check the listing above carefully, and some resemblance will be seen to the lettering on Figure 1. Let's look at the line starting with 4, and the line immediately below this line, to see what this strange format means. The number 4 will be used as PARA1 for a code 500 (could be any code 500-599; the letters that will be plotted are the ones between the quotation marks, Xgn; these are one of the rock unit labels on the figure. The "EOT" (always upper case letters, please, stands for END OF TEXT and is used to end the lines that will be plotted when a PARA1 of 4 is used. Let's look at the line starting with 6, and at the two lines below it. If PARA1 of 6 is entered, these two lines will be plotted (see figure 1 for how it looks. The "following "EOT" line ends the two line text entity. They will be digitized together! Let's digitize the alphanumeric data, and then discuss the punctuation of the ASCII file, and some of the characters that plot differently than they appear in the file.

Please use code 500 for all of the rock unit labels. PARA1 will be entered to match the number of the entry in the file DRAW.RU needed on the figure. PARA2 specifies the height of the letters needed in rasters (Remember ? 1 raster=1/1016 inch).

Digitizing for symbols without leaders is done by moving the cursor to the precise position where the lower left corner of the block of text should be plotted; in the case of the Xgn, the lower left corner of the X; let's run through the key strokes needed to place one of these Xgn labels (code, PARA1, PARA2) in sequence 500 4A 80A, then digitize the entry by moving the cursor to the lower left corner of the X and pressing the 1 key. Lets use a 501 code for the entry of the LAST CHANCE LODE block; the key strokes would be 501 6A 80A; digitizing would be done using the 1 key after the cursor had been precisely positioned at the lower left corner of the L in LEFT; both lines of text will be plotted; separate entry of the word "LODE" would require a different ASCII file entry. Specification of certain infrequently used characters in the ASCII file causes plotting of some of the geologic characters not found on the keyboard. Some of these are used on Figure 1.

ASCII FILE	Symbol plotted
\	Cambrian C
&	Pennsylvanian P
@	Triassic TR
{	o superscript degree symbol
}	" superscript second symbol

(You can't use the quotation mark to specify seconds in the ASCII file because it is a delimiter in BASIC, the language used in writing this program.

Now you can read DRAW.RU and decipher some of its arcane symbols.

Please resume digitizing, use the 500 code, the PARA1 number matching the number in the DRAW.RU file for the entry you want to digitize; use 80 as the number for PARA2, and digitize the remaining rock unit labels (except for the Psc label that has a leader). Use the 1 key in each case.

Digitizing a label with a leader is done differently. The letters Psc are digitized by moving the cursor to the lower left corner of the P, and then pressing the 0 (zero key), then the leader is digitized by moving the cursor to one end of the leader, pressing the 0 key, moving the cursor to the other end of the leader and pressing the 1 key. A line will be drawn between the last two points. The leader in this way is "attached" to the digitized label, as it should be. Multiple leaders can be digitized (see *documentation for GSDRAW and GSMAP).

The digitizing of Figure 1. is now complete.

ENDING A DIGITIZING SESSION

Enter a CODE of **999** to return to the Main Menu

Now let's plot the results.

Make sure that the plotter is loaded with paper. Put a fine black pen in position 1, a fine red pen in position 2, a fine blue pen in position 3, and a coarse black pen in position 5 (these positions correspond to choices made when creating the plot file (DRAW.PLT) which we will use.

Enter 9 (from the keyboard of the computer to choose Option 9 from the Main Menu.

```
                         G S D R A W

                                   CURRENT DATA BASE: SPECIAL
                                           MAP TITLE: EXERCISE

  1  -  START A NEW DATA BASE
  2  -  OPEN AN EXISTING DATA BASE
  3  -  DIGITIZE NEW LINE SEGMENTS
  4  -  DELETE LINE SEGMENT
  5  -  RECOVER LINE SEGMENT
  6  -  CHANGE PARAMETERS FOR LINE SEGMENT
  7  -  LIST CONTENTS OF DATA BASE
  8  -  PLOT ON THE SCREEN
  9  -  PLOT ON THE HARD COPY PLOTTER
 10  -  MERGE ANOTHER DATA SET INTO CURRENT DATA SET
 11  -  COMPUTE POLYGONAL AREA
 12  -  EXIT

                              ENTER CHOICE BY NUMBER: 9
```

After entering 9, the screen will clear. A warning message, followed by a prompt will be displayed on the screen.

PLOTTER SHOULD BE TURNED ON AND PAPER LOADED!!!!!! You don't need to respond to this warning (just check to see that the plotter is ready. If it isn't and you go too far into the plot sequence, you may have to re-boot the system. Respond to the prompt.

DO YOU WANT TO USE A BATCH COMMAND FILE (Y/N)

Enter **Y** for this first plot. A **N** requires answering a lot of questions; do that later. Take advantage of the batch command (plot) file on the disk.

The next prompt will ask for the name of the plot file.

ENTER BATCH COMMAND FILENAME:

Enter **DRAW.PLT** Now the plotter will go to work. Watch the screen, watch the plotter, or drink a cup of coffee. But don't go far. In a few minutes, prompts will appear that require entries from you.

To finish off a plotting sequence, three prompts will require entries from the keyboard. The first prompt provides the opportunity to replot a single entry.

REPLOT SINGLE ENTRY (Y/N): Enter **N**

The second provides opportunity to plot corner braces to show where the corners of the data base are located.

DO YOU WANT TO DRAW CORNER BRACES? (Y/N) Enter **N**

The third provides opportunity to draw tick marks inside the drawing, a capability that may be useful during editing of data bases.

The default answer (provided by hitting the ENTER KEY) to all of these questions is **N**.

Entry of an answer to the third of these prompts returns operation to the main Menu.

If you have time, try out some of the other Options to see how they work (see description in *Documentation). By the way, according to the mandates of the current version of GSDRAW, DO NOT ask for printouts (on the printer) unless the Printer is **On**. You are free to do as you like, far be it from us to dictate, but do so knowing that requests for printouts without a printer ready to go may cause the system to take time out, and may require re-booting the computer. YOU WERE WARNED !

If you want to learn more about plotting enter 9 and make another plot, but this time do it interactively. The print below is the DRAW.PLT file,with annotations. Its contents provide the replies for the screen prompts in interactive plotting.

```
1,1                                   Xscale,Yscale
N                                     Draft mode No
Y                                     Rotate Yes
12,2                                  Speed,Force
0.1,0.15                              X,Y size of posting
1,1,0,0,  "fine black lines"
4,5,3,0,  "heavy black lines"
5,1,9,0,  "long dashed lines"
8,1,0,102,"triangles on thrusts"
0.2
9,1,3,102, "fine blue"
0.18
8,5,0,0,  "heavy lines on thrusts"
9,5,3,0, "heavy lines-non thrusts"
11,2,0,101,  "fine decorated red"
0.1
201,1,0,0,
202,1,0,0,
205,1,0,0,
206,1,0,0,
210,1,0,0,
500,1,0,0,  "text"
DRAW.RU
501,1,0,0, "text"
DRAW.RU
300,1,0,0,  "symbols"
N
400,2,1,0, "red stipple"
3,40,0
400,1,0,0, "black outline of red stipple"
0,40,0
401,3,0,0, "blue lined area"
3,50,-45
301,1,0,0,
N
0,0,0,0,
```

Consult the *documentation to see what these answers mean. To ask for an interactive plot, enter **N** to the prompt asking if you wish to use a BATCH COMMAND FILE.

Digitizing in GSMAP is the same as Digitizing in GSDRAW. If you digitized Figure 1 and understand its constructs and the uses of the different code groups, you already know about digitizing in GSMAP. How's that for a JUMPSTART !

Most of this section is concerned with the procedures in GSMAP that are different from those in GSDRAW. The procedure for opening a data base is described, digitizing is not reviewed, nor is plotting. The small differences between the two programs in plotting are fully prompted from the screen.

GSDRAW records data in X,Y coordinates (in inches as sent to the computer by the digitizer). GSMAP records data in Latitude/Longitude coordinates. This enables the use of map projection routines so that digitizing and plotting can be done using certain of the most common map projections.

Many of the topographic maps used as base maps for geologic mapping can be digitized using the UTM map projection. In the example here, the UTM will be specified. Within acceptable tolerances, UTM can be to used digitize 7 1/2 and 15 minute quadrangles. It is the correct map projection for 1/3 of the 1° X 2° quadrangles (the ones that have a principal meridian central to the map (a quick test for this; is the line of latitude at the center of the sheet divisible exactly by 3 ? if it is, UTM and Transverse Mercator, the projection used by the Army Map Service, are the same. Much more detail about map projections is provided in a later section.

GSDRAW required that CONFIG.DIG, CONFIG.SCR, and CONFIG.PLT be available on the default drive. GSMAP also requires these. The program file GSMAP.EXE is required. In addition, GSMAP requires a PROJECTION file. This is an ASCII file that tells the computer which projection to use and provides data to the computer needed for the projection calculations. The projection file used here is called MAP.PRJ. Projection files are discussed in the *documentation for GSMAP. MAP.PRJ is printed below, but the meaning of all of its lines is not discussed here. The next-to-last line of the file (105,0,0) specifies the principal meridian of the UTM zone in which the map to be digitized or plotted must fall. This projection file can be used for digitizing or plotting between longitudes 108 and 102 for UTM, Transverse Mercator projections, and for **Small** areas such as 7 1/2 or 15 minute quadrangles in Lambert Conformal Conic or Polyconic map projections, but not for large areas, such as state or national maps maps where the Lambert Conformal Conic or Albers Equal Area projections are used. GSMAP supports use of these projections but different projection files must be used.

Example of a UTM projection file; see documentation for the meaning of the records in this file.

```
1                          The lines to the left
3                          are a printout of the
6378.2064                  file MAP.PRJ
6356.5838
105,0,0
0.9996
```

GSMAP exercise

Figure 1 has been set up so that the + symbols can be used as the corners for a GSMAP exercise.

The coordinates below will enable opening of a data base and digitizing into that data base, using the MAP.PRJ projection file. These coordinates are in the proper format for data entry: first Latitude, then Longitude, in Degrees, Minutes, Seconds.

Northwest corner 38,15,0,106,0,0
Southwest corner 38,0,0,106,0,0
Southeast corner 38,0,0,105,30,0
Northeast corner 38,15,0,105,30,0

Enter GSMAP

A *disclaimer screen will appear. Under the disclaimer text, four lines of text will be displayed.

1 - Start a new data base
2 - Open an existing data base
3 - Exit
Enter choice:

You must first activate a data base, Option 1 or 2, either by starting a new data base, or by opening an existing data base. In this case let's create a new data base, one that uses coordinates that match the plus signs on Figure 1.

Enter **1**

The screen will clear and a series of prompts will appear. The first two (request entry of a map data base name and a title for the map. Follow directions (The names used in this exercise are shown in BOLD print.

ENTER MAP DATA BASE NAME: **TEST**
ENTER TITLE OF MAP: **TEST**

The next prompt asks for entry of a number specifying the quadrant of the earth. Enter **1** (for North America).

See *documentation for definitions of the earth's quadrants.

ENTER EARTH'S QUADRANT(1=NW,2=NE,3=SE,4=SW): **1**

Follow the prompts. Their meaning should be clear; the Latitude/Longitude for each corner is entered in turn in response to the screen prompts; for each corner, latitude first, longitude second; both in degrees, minutes, and seconds (and decimal seconds), separated by commas as shown. The coordinates shown are those for the exercise project (Figure 1).

```
ENTER LAT/LON OF NORTHWEST CORNER
DD,MM,SS,DDD,MM,SS: 38,15,0,106,0,0
ENTER LAT/LON OF SOUTHWEST CORNER
DD,MM,SS,DDD,MM,SS: 38,0,0,106,0,0
ENTER LAT/LON OF SOUTHEAST CORNER
DD,MM,SS,DDD,MM,SS: 38,0,0,105,30,0
ENTER LAT/LON OF NORTHEAST CORNER
DD,MM,SS,DDD,MM,SS: 38,15,0,105,30,0
```

After the coordinates of the NORTHEAST corner are entered, the screen will return to the Main Menu. The name and title of the data base will be displayed.

```
   G  S  M  A  P
                                          CURRENT DATA BASE: TEST
                                                  MAP TITLE: TEST
  1  -  START A NEW DATA BASE
  2  -  OPEN AN EXISTING DATA BASE
  3  -  DIGITIZE NEW LINE SEGMENTS
  4  -  DELETE LINE SEGMENT
  5  -  RECOVER LINE SEGMENT
  6  -  CHANGE PARAMETERS FOR LINE SEGMENT
  7  -  LIST CONTENTS OF DATA BASE
  8  -  PLOT ON THE SCREEN
  9  -  PLOT ON THE HARD COPY PLOTTER
 10  -  MERGE ANOTHER DATA BASE
 11  -  COMPUTE POLYGONAL AREA
 12  -  EXIT
                                     ENTER CHOICE BY NUMBER:
```

Enter 3 to select option 3. Let's examine the differences in starting a digitizing session in GSMAP from starting digitizing in GSDRAW.

After entry of **3**, the screen will clear and a different prompt will appear:

ENTER FILENAME OF PROJECTION PARAMETERS:

ENTER **MAP.PRJ** This early entry of the complete name of the projection file is the reason it must be ready ahead of starting any real work with GSMAP. In real life, be very careful to match the projection specified by the projection file with the projection of the hard copy being digitized.

The next set of prompts will be almost the same as those for GSDRAW ! The differences are only in the naming of the corners.

DISPLAY PREVIOUS DATA? (Y/N) **N**

After this entry from the keyboard, the next entries are made from the keypad of the digitizer cursor. Use the 0 key, as specified in the prompts.

ENTER 0(ZERO) KEY ON CURSOR KEYPAD TO SYNCHRONIZE DIGITIZER INPUT
ENTER NORTHWEST CORNER ON DIGITIZER
ENTER SOUTHWEST CORNER ON DIGITIZER
ENTER SOUTHEAST CORNER OF DIGITIZER
ENTER NORTHEAST CORNER ON DIGITIZER

Make these entries in the same way you did in opening the GSDRAW digitizing session (see directions provided earlier, if there are any uncertainties). Remember that the cursor can be located anywhere within the active area of the digitizer board for synchronization, but must be **precisely** located when entering the corners.

Digitizing in GSMAP is the same as in GSDRAW. The same code groups are used, their functions are identical,PARA1, and PARA2, have the same meanings, the keys on the digitizer have the same uses, and entry of a code of 999 ends a digitizing session.

If you are so inclined, you could digitize Figure 1 again - but once is more than enough. So let's move on to discuss some of the other differences between GSMAP AND GSDRAW

GSMAP	GSDRAW
Definition of plot areas	
Corners are specified by latitude/longitude in plot files	Corners of plot area are those of the data base, or are set by the digitizer using windows (see *documentation)
Scale	
There is no inherent scale in data base; the scale of a plot is set by the plot file	Data is recorded in data base in inches (corresponding to the drawing used to start the data base. The plot scale is specified in the plot file as a factor relating to the size of the original drawing.
Scale of symbols and text (300-399 & 500-599 codes	
Independent of plot scale	Size changed as a function of the SCALE in **X**, independent of SCALE in **Y**.
Data Base Corners	
Specified by latitude/longitude from keyboard when starting a new data base; entered from digitizer at start of a digitizing session	Entered from digitizer when starting a new data base; entered from the digitizer when starting a digitizing session.

MAP PROJECTIONS

GSMAP, GS MRDS, GSLITH, and GSPOST have forced many users to reaquaint themselves with map projections, a topic covered to some degree in dimly remembered classes. From a practical standpoint, digitizing from a base map and plotting to make precise overlays for base maps aren't really very complicated. One reference is very important. USGS Bulletin 1532, by J.P. Snyder, 1982 contains answers to the questions you should have. Information on the map projection is almost always printed near the lower left corner of the map. On 1^{o} x 2^{o} degree maps, The projection is given under the bar scale. Look for magic words, Lambert Conformal Conic, Polyconic, Transverse Mercator, Albers Equal Area, (and such) on map borders.

For work with 7 1/2 and 15 minute quadrangles, a quote from Snyder, p. 127 may provide needed perspective ".... the discrepancy between measurements of diagonals on two maps of the same quadrangle, one using the Transverse Mercator or Lambert Conformal Conic projection and the other using the Polyconic, can reach about 0.05 mm." This distance, .0196" is about a half-line width for contact-weight lines (.003 to .005 inch. Read all of p. 127, as .05 mm constitutes a worst case. 7 1/2' and 15' quadrangles thus can be digitized using the correct UTM or LCC projection files. If the quadrangles are near the edges of the UTM zone, plotting should be done using the LCC projection because the UTM will provide a plot that's at an angle with the plotter paper.

1:250,000 scale 1^{o} X ^{o} maps are almost always on Transverse Mercator projections. Snyder points out, p. 63 "The central meridian of about one-third of these maps coincides with the central meridian of the 'UTM' zone, but it does not for about two-thirds, the wing sheets, which therefore do not perfectly match the center sheets. The USGS has assumed publication and revision of this series and is casting new maps using the correct central meridians". When digitizing from 1^{o} x 2^{o} maps, using Transverse Mercator projections, follow directions in GSMAP documentation, but make sure that the meridian used in the projection is the central meridian for the map at hand.

The 1:100,000 scale maps of the 30x60 minute series use the UTM projection, so the principal meridian to be used in the projection isn't the meridian at the center of this map. How much difference this might make for digitizing and plotting will depend on where the sheet is with respect to the principal meridian for the UTM zone.

Check map projections and base maps before digitizing; some suggestions on how to check base maps are offered here.

Green line mylar maps are always right. ?? **RIGHT** !! Note that many of the green line map bases that we use have been made by splicing a number of quadrangle maps together. The match with a GSMAP plot, or the validity of digitizing will depend on the precision of the splicing. Each piece can be digitized, but the composite may not all fit. Check **before** digitizing.

Check the fit of overlays starting with the corner points. Do this first, before digitizing, and before plotting an entire map. You can be sure that if the corners don't match, the rest of the map won't either.

An easy way to check is to make up the proper projection file, and a plot file with corners specifying the corners of the base that will be used in digitizing and which must be matched (later) in plotting. Remember that the corners plotted in GSMAP are those specified in the plot file, not those of the data base, so any data base can be used for a test plot. All you need is a plot file with the proper corners and at the proper scale. No CODES need be plotted; a 0,0,0,0, to end the file will suffice, the corners can be plotted (Yes, plot the corner braces), and geodetic tick marks at an appropriate spacing. These index marks can be compared with those on the base map. If there is a problem don't go farther, until the source of the problem can be identified. Some problems might be, use of an inappropriate projection file, the wrong corners on the plot file, mis-identification of latitude/longitude marks on the base, mismatch of scale of map and plot. Later, the data base used for digitizing should be checked by digitizing some of the points on the map with known latitude and longitude. A printout of the coordinates of some of these points will either inspire confidence or mandate a new start.

Mark the corners to be used in digitizing, make them easy to find and easy to reoccupy with the cursor on the digitizer. A shallow cross cut into a mylar sheet with a knife blade leaves no room for doubt as to the location of the data base corner.

Two sets of latitude/longitude corners on the same map ? There are notes on many recent 7 1/2 minute quadrangle maps that should be read. For example "Polyconic projection 1927 North American datum" "To place on the predicted North American Datum 1983 move the projection lines 7 meters north and 51 meters east as shown by dashed corner ticks". Which to use ? The corners of the map that's contoured have latitude/longitudes using the 1927 datum. Stick with the 1927 datum, at least for the present.

Steps in planning a GSMAP project.

Start by visualizing the final product. What must be shown, how many overlays must be generated to accommodate publication needs for the separate printing negatives needed for screening, color, lines, symbols, lettering, and so on. Digitizing from copy at final map scale will simplify decisions on letter and symbol size, and assist in making a final product that is aesthetically pleasing as well as accurate. 1:1 digitizing and plotting usually requires use of a magnifier during digitizing. To us this is a small price to pay to simplify thinking and checking of plots against original materials.

1. Identify the base map projection and scale, and find and mark the latitude/longitude corners that will be used in digitizing. Look carefully for joins between pieces of the base; check to see if these will be a problem, perhaps even a problem requiring digitizing and plotting in pieces.

2. Work from stable base copy if at all possible. If not, find an environment that won't change during digitizing. Changes in humidity are worse than changes in temperature in causing changes in the scale of paper copy. GSMAP accommodates changes in scale but requires indexing of the data base corners to the digitizer board. GSMAP does not accommodate changes in scale, or movement of the hard copy on the digitizer board during a digitizing session. If there has been a change of humidity, close the data base and open it again. Then index the copy on the digitizer board. If precious lines are only on rain-spotted field sheets, and the scale is in doubt, index digitizing to a greenline overlay, and adjust small areas of the paper copy to fit - just as you would do if you were making a copy in ink - and move the paper, not the mylar, as needed. Make each area fit, one at a time. There is no "fix" for digitizing done using an improperly indexed hard copy.

3. Make up the projection file needed for digitizing and plotting.

4. Now, start to plan the codes that will be used for digitizing the map. This is a good time to start making an annotated plot file. Print a copy for use during digitizing. You will need a record of the codes you used and the purpose for each. Why not kill two birds with the same file ? A printed copy of this file will be useful during digitizing to help keep codes consistent.

5. Make up and print the file containing text entries for the 500-599 code entries that will be used --- the labels for rock units, and other text belonging to the map. The printed copy will provide a ready reference during digitizing.

6. Start a GSMAP data base with corners that match the corners to be used in digitizing; then digitize a few points on the map; start with points that have known latitude and longitude. Use a code unlikely to be used later, like 399, then print out the latitude and longitude and compare these with the coordinates on the map.

7. Plot the corners and digitized internal reference points using stable film, add geodetic tick marks at suitable intervals, and compare with the base.

Planning codes for digitizing.

How much standardization of codes is necessary ? The ability to edit and change means that you aren't stuck with an early unwise decision. We suggest that what happens between a consenting adult and *his Personal Computer is between them and their software.

Suggestions offered here may be useful to start, but should not be misconstrued as legislating requirements. It seems to us that the consistency of use of codes during digitizing for each project is of primary importance. Enough code groups must be used to provide easy separation of elements during plotting. The suggestions of particular numbers for particular kinds of elements given below are intended more to indicate the kind of elements that require separate codes than to specify a code for each. We can't remember these either !

Make fully annotated plot files so that the codes used for all digital data can be understood by another user, and so that you can remember what you did, after the lapse of a few hours has obliterated short term recollection of details (most of us have memories with a short half-life).

If a number of different maps are to be digitized, sticking with one set of codes throughout will simplify digitizing and plotting - for example, a slight modification of a copy of a plot file takes less time than starting from scratch.

The seven code groups of GSMAP and GSDRAW have functionalities that dictate many uses. Suggestions here are divided according to these code groups.

Planning codes for lines (1-99, and 601-699) should begin with decorated lines that are to be plotted using decorations that are on one side of the line (like thrust faults) because the direction of digitizing is important. Be aware of both the advantages and disadvantages of splining. Check the documentation describing the 600-699 codes.

Code Group 1-99 Lines and decorated lines

Reserve codes 1-15 for geologic lines

Code	Line type	Decoration	Specification
1	0	0	Fine solid lines, 00/000 pen Example: contacts
2	3	0	Fine dashed lines, 00/000 pen Example: inferred
3	1	0	Fine dotted lines, 00/000 pen Example: concealed contacts
4	0	0	Heavy solid lines, 0/1 pen Example: faults
5	9	0	Heavy dashed lines, 0/1 pen Example: concealed faults
6	7	0	Heavy dotted lines, 0/1 pen
7	0	102/103	Heavy solid lines with triangular teeth on one side Example: thrust faults 0/1 pen
8	9	102/103	Heavy dashed lines with triangular teeth on one side Example: inferred thrust faults
9	7	102/103	Heavy dotted lines 0/1 pen Example: concealed thrust faults

Code group 100-199 symbols, with posting from an ASCII table.

Reserve codes 100-115 for geologic entries, and be sure that the name of the ASCII data file for related data is included in the plot file created for the map

Code group 200-299 Individually rotatable symbols. These symbols have standard geologic meanings. Uses and "standardization" of codes are defined by the CONFIG.PLT file

Code group 300-399 symbols. Some of the symbols in the CONFIG.PLT file have standard meanings; others don't. Any code can be used for any symbol.

Reserve codes 300-315 for the geologic entries, and use higher numbers for cultural features, geography, etc.

Code group 400-499 polygons.

Reserve 400-415 for geologic features, and use higher numbers for cultural features, geography, etc.

Code group 500-599 alphanumeric entries drawing from an ASCII file. Separate different kinds of uses. We suggest that 500-515 be reserved for geologic entries, and that 555 be used for labels for geologic units. These labels may be an important part of the data base if the digital data is exported to a GIS system. We strongly suggest that these labels be clearly separated from other types of text. If there are labels for features such as areas of rock alteration, these labels should be entered using a separate and different code. This will simplify later use of the digital files.

Multiple ASCII files can be used for the 500-599 code group, but only one for a particular code. Consistency is needed. We suggest that the name of the file used for labels for rock units should be DATABASE.RU; If another file is needed, use a different extension.

Code Group 601-699 Splined lines and decorated lines

Reserve codes 601-615 for geologic lines

Code	Line type	Decoration	Specification
601	0	0	Fine solid lines, 00/000 pen Example: contacts
602	3	0	Fine dashed lines, 00/000 pen Example: inferred
603	1	0	Fine dotted lines, 00/000 pen Example: concealed contacts
604	0	0	Heavy solid lines, 0/1 pen Example: faults
605	9	0	Heavy dashed lines, 0/1 pen Example: concealed faults
606	7	0	Heavy dotted lines, 0/1 pen
607	0	102/103	Heavy solid lines with triangular teeth on one side Example: thrust faults 0/1 pen
608	9	102/103	Heavy dashed lines with triangular teeth on one side Example: inferred thrust faults
609	7	102/103	Heavy dotted lines 0/1 pen Example: concealed thrust faults

Archiving GSMAP databases

Nothing is deader than last week's set of files. GSMAP database files and the associated plot files and projection files may constitute something of more than immediate value. If so, copies should be "archived". Remember to include a copy of the CONFIG.PLT file used for plotting. Remember that this can be modified by the user, and hence can be changed. Your fully annotated plot file will be invaluable to a subsequent user. You might even write a README file to jog your own memory - for example, what color pens go into which positions in the carousel.

The 100-199 code group of GSMAP and GSDRAW is the code group used to plot symbols and numerical data taken from an ASCII file associated with the location represented by the symbol. Data in the table can be alphanumeric; locality identifiers must be numbers. Directions for using this code group will be found in the documentation for GSDRAW and GSMAP. Planning of illustrations using this code group must provide enough different codes to separate all the various symbols and symbol sizes needed. Symbols and symbol sizes are specified in the plot file, not in the data base. The locality identifier associated with the digitized point must be a number. This number is used as PARA 1. PARA 2 is used for an angle of "rotation" that specifies the position and orientation of posting of numerical values and locality numbers.

The format for the ASCII file containing data for 100-199 codes is described in the *Documentation.

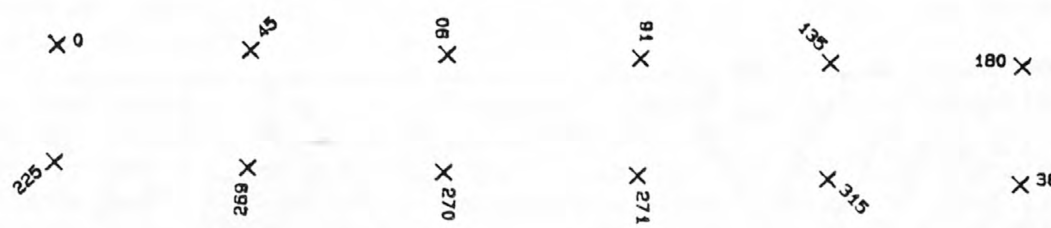

Figure 2. Illustration of plot positions with different angles specified in PARA2

There is no ready method for moving points or lines. GSMAP and GSDRAW allow you to delete entries and to add others from the digitizer. At cleanup time for an illustration it may become necessary to change codes, PARA1 or PARA2 for particular entries, or for groups of entries to modify the illustration.

Editing starts with identification of the entry number for a particular graphical element. At the start of digitizing data in a new database the computer assigns the number 1 to the first entry digitized, 2 to the second, and so on, for each entry, whether point, line, or, polygon. These sequential numbers are not changed by editing of parameters, deleting or undeleting of entities. Numbers may be changed by merging of data bases, or by use of utility programs such as GSMSUB, GSMPOLY, and GSMASC. Numbers therefore must be determined for the particular data base being modified (not for a previous version).

Suggestions below provide several ways of identifying entry numbers.

- The number of the entry is plotted on the map when a draft mode plot is made; the number is drawn just to the left of a one-point entry, or just to the left of the first digitized point if there is more than one point.

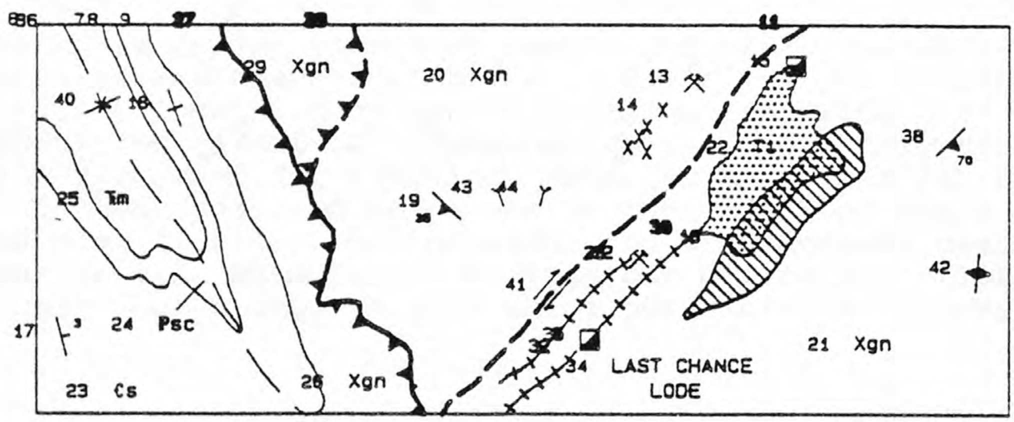

Figure 3. Draft mode plot of Figure 1.

- In many cases, a draft mode plot will unequivocally identify the number of the entry in question.

- If you exercise Option 8 and plot the data on the screen, the entry numbers are displayed for the entry being plotted. With a finger on the F9 button and an eye on the screen, it may be possible to identify the number, or at least get a close approximation of the number.

-If you exercise option 4 (DELETE LINE SEGMENT) using the mode in which data is plotted on the screen (perhaps with windowing set from the digitizer to get the area of interest plotted at a large size), guesses (informed ?), entry by entry, can be quickly confirmed. Remember that a line identified for deletion will disappear from the screen, and that the screen prompt asking for confirmation that you indeed do want to delete the line lets you identify an entity for deletion, have second thoughts, not delete it, and thus not introduce a mistake. If you set a window using the digitizer that is exactly the same size as the window on the screen (make a template for your particular monitor), the 1:1 screen plot lets you make quick comparison of data on a hard copy with the data on the screen, and the "delete" technique using option 4 will almost always identify a particular entry.

- On a complex map, there may be ambiguities due to over-posting of entry numbers and/or data on draft-mode plots. These ambiguities can be reduced by plotting a small piece of an illustration at a large size, by specifying a large size for the label (ENTER WIDTH,HEIGHT FOR LABEL CHARACTERS); .1,.15 might generally be appropriate, but .1,.5 might produce more legible numbers in a specific case (tall skinny numbers). Plots can be interrupted (F9) key, the paper in the plotter changed, and restarted (Return key) to eliminate specific problems with over-plotting of entry numbers.

- For the most recalcitrant cases, there are a few other tricks. Start by listing the contents of the data base (Option 7) and by printing out this listing (the -1 option to get all line codes in the data base. This listing has the coordinates of the first and last point for each entity. In GSDRAW this provides these coordinates in inches, so these can be measured on the original drawing, and the number of the entry identified. In GSMAP these listings are in latitude-longitude and so not so easily determined with requisite precision, although the general position can usually be quickly estimated. Reference to the printed list will tell you if a certain number is possible for a particular graphical element (use the plot files to verify the kind of entries that you digitized with each particular code, for 500 codes check the number (PARA2) of the associated words and numbers).

- A technique of last resort utilizes the REPLOT SINGLE LINE option displayed as an on-screen prompt at the conclusion of making all plots. Print the Plot File, and all other ASCII files (those supporting 500, 100 codes. Copy the plot file, change it to make a draft mode plot, but put in a 0,0,0,0, line immediately after the specification of the width and height of the label characters (before any codes have been specified). Make a plot using this plot file. You can then plot a "single entry" following prompts on the screen.

REPLOT SINGLE LINE Y/N: Answer **Y**, specify the number of a suspect entity. Use the list of contents of the data base so that you can match the line number with the proper code, and use the printout of the plot file so that you know the parameters for plotting. Let the plotter do its work, check to see if you have identified the offending line number; after plotting the single line, the screen will return to the REPLOT SINGLE LINE prompt; remember to answer **Y** (the default is **N**). This procedure can be repeated for single entries until the one requiring change can be identified.

*Horseshoe nails, commas, blanks, quotation marks, and other causes of error messages

Some error prompts are readily understood - others, not so; in the latter category:

The plotter is humming and drawing, and starting to plot one of the 500 codes - and its silent screen prompts:

Input past end in line 6750 of module GSDRAW at address 1D95:5F)2

What's wrong ?

Probably there is a problem with punctuation in the ASCII text file. Examine the grammar. Check to see that that all required commas and quotation marks are in their proper places and that none are missing. Any time there is a problem in plotting 500-599 codes look carefully at the ASCII text file and make sure that all commas and quotation marks are properly placed.

Or midway in plotting the 300 code the screen prompts
Overflow in line 6300 of module GSDRAW at address 1D95:5911
Hit any key to return to system
What's wrong ?

In this case the plot file must be OK - it started the 300 code, the ASCII text file isn't being used - so look at the contents of the data base. The error in this case probably is with PARA1 or PARA2 of a particular data point -- in a specific case, PARA1 was put in as 11116 (the digitizer can stutter if the cursor is moved during data entry).

This time - you know that the data base is OK; but you changed the plot file, and now north is east and the plot, though recognizable, is all screwed up. See figure, next page.

Further, the plotter shows the following error message

3: BAD PARAMETER

The problem is almost certainly in the plot file. Figure 4 was plotted from a database that would draw Figure 1 with a valid plot file. One comma was deleted from the plot file to draw this figure. It changed the plot to draft mode, rotated it in the plotter, deleted many lines, and made a quite unreasonable mess.

If you use GSMAP and activate a GSDRAW data base or GSDRAW to open a GSMAP database, it will seem that you are able to do so, but it doesn't work. Try it ! Use GSMAP to open data base "DRAW" on the disk, and notice the strange characters added to the MAP TITLE on the Main Menu screen. Or use GSDRAW to open "MAP", and try a screen plot. The error message:

Illegal function call in line 350 of .... will show that all isn't well. In case of troubles, check to see that the data base and the Program match.

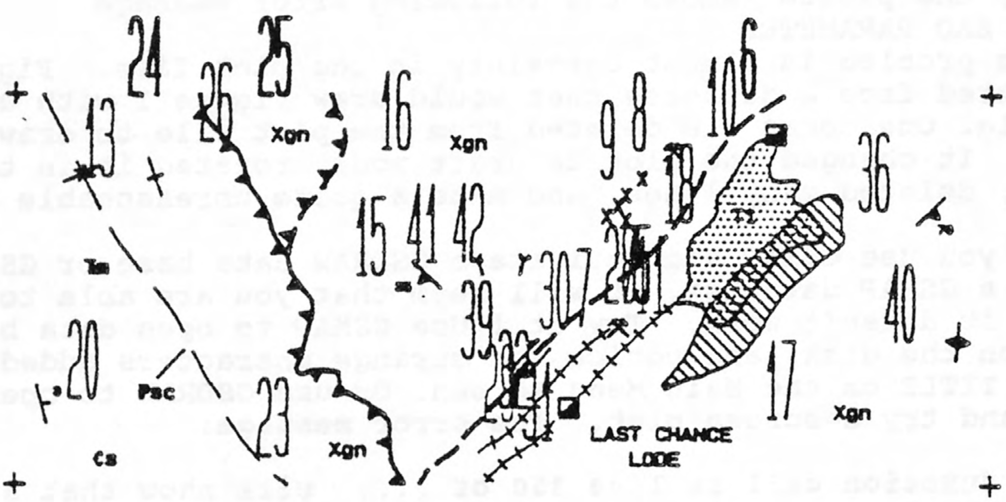

Figure 4. But for a missing comma, this would be Figure 1.

Or, the plot file looks perfect, all commas in place; The plot's perfect **BUT** after finishing the plot, the screen prompts

PREMATURE EOF IN BATCH CONTROL FILE HIT ANY KEY TO CONTINUE

A *HORSESHOE NAIL is missing from the plot file ! There is no carriage return after the final line 0,0,0,0, and even though you may not be able to see it, the computer demands it to finish off the plot sequence.

If the printer is not ready, but you ask for something to be printed, the error message below will be displayed.
Device fault in line "3960" (the number will depend on which printout has been specified; but the prompt "Hit any key to return to system" will get your attention.

Or, the plot file looks perfect, all commas in place; but it doesn't plot anything ! After a bunch of text passes over the scream, it reaches the prompt asking if you want to replot a single line ? You only want it to plot something on the plotter ! Check the plot file to see if there is a blank line at the head of the file. If there is, the input from the plot file is shifted down one record, and quickly, the plot file asks the computer to plot a line code of 0 (zero); this is equivalent to telling the program that the plot is finished, so it dutifully prompts you to to direct it to draw a single line if you wish. It did what you told it to do. Delete the blank line at the top of the file.

Or, after a promising start, and plotting of some lines or symbols, the silent screen furnishes the following prompt just after starting to consider one of the 500 codes --

FILENAME FOR TEXT = DRAW.RU
AN ERROR HAS OCCURRED OPENING DATA FILE DRAW.RU
CANNOT PLOT 500 SERIES DATA. HIT ANY KEY TO CONTINUE

The computer is trying to tell you that the data file isn't where it is supposed to be, and that it can't find it. Examine the plot file to see what you put in about the data file, and look to see where the file is located; it couldn't open the file because it couldn't find it.

After a promising start plotting lines, perhaps even a symbol or two, the screen prompts:
String Space Corrupt in line 0 of Module GSDRAW at address BF00:0000

A likely explanation is that the File CONFIG.PLT has a problem. Perhaps when you added a symbol you left a blank line, or claimed that a symbol had a move more or less than it really did. Attempts to plot symbols located in the file after the error will draw the prompt warning of corrupted string space; plots of symbols in the file before the mistake will be successful; this is an attempt by the computer to lull you into thinking that all is well, even when it isn't.

Another error message is peculiar to Version 4.0 of GSDRAW and GSMAP. If you attempt to use an EGA adapter that has less than 256 K RAM (such as the older IBM adapters, you will see the message:

Illegal function call in line 3851 of module GSDRAW at address 065:3985
Hit any key to return to system

There is a slightly different counterpart message for GSMAP.

EGA adapters with less than 256 K RAM can be used in CGA mode (change the CONFIG.SCR file (see *Documentation, Appendix 1).

Certain computers and certain accelerator boards are not compatible with adapters and monitors in the EGA mode. The error message is the same as above. Check documentation for your system.

EXAMPLES OF PROBLEM SOLVING

Subsequent examples explore some real problems brought to our attention by users and abusers of GSDRAW and GSMAP. Perhaps these suggestions will be useful. Some exploit the capabilities of utility programs (Selner and Taylor, 1987, OF-87-496C) to assist GSMAP and GSDRAW.

How to decide between GSMAP and GSDRAW, if either could be used ? In the case covered here, the end product was to be an index map (Wallace and others, 1986, MF-1841-A). Information came from the Leadville $1^{o} \times 2^{o}$ sheet (1:250,000 scale). GSMAP was the obvious choice, because the base was on Transverse Mercator projection, and all points and lines had latitude, longitude coordinates. GSDRAW was finally selected because the scale of the index map would be determined in considerable measure by the space available on the final layout. GSDRAW's automatic scaling of the sizes of lettering was needed to be sure that letters would fit into spaces available on a final plot at a scale that couldn't be determined at the time of digitizing. The scale of the published illustration was 6/10 that of the original; the illustration below is drawn at 4/10 original size. Twenty different codes in the 500-599 group were used for lettering to accommodate the many different slant angles needed; the drawing is otherwise routine.

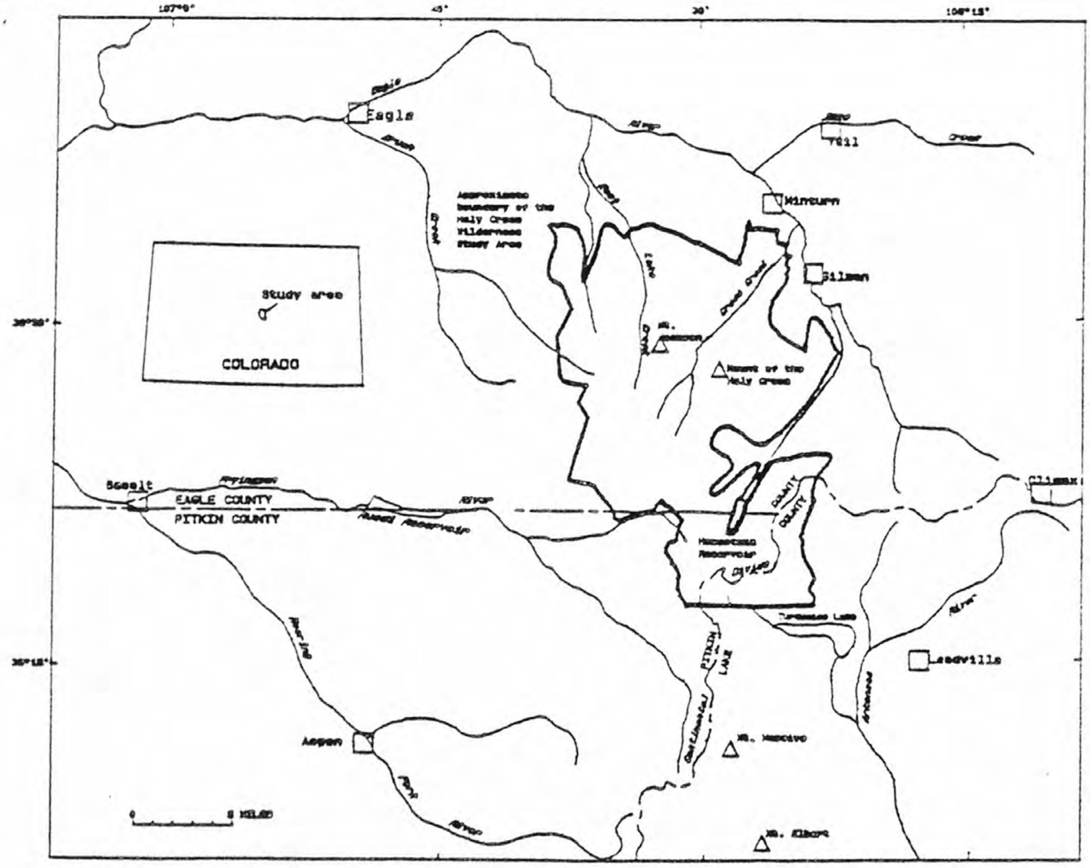

Fig. 5. Index map plotted at 0.4 digitizing scale

THE BRAZILIAN DEFENSE, GSDRAW
For maps too big for the digitizer

The problem was due to size. The available digitizer was too small to accommodate the map to be digitized. GSDRAW's capabilities were needed, not GSMAP. How to digitize a map in pieces and precisely combine the pieces (electronically) so that the entire illustration could be plotted as a whole, at small size?

First: remember(?) that the Lower Left and Upper Left corner points define the **vertical** direction for GSDRAW, and that the **horizontal** direction is perpendicular to this vertical direction. "Horizontal" is not independently determined. Use the corner points on the left side as keys to illustrations.

The Brazilian defense starts with a long straight line on the left side of the map. This line will be the key to combining two separately digitized databases using the merge option.

Step 1. The illustration could be digitized in two pieces as shown in Fig. 6. The active area of the digitizer is shown by dashed lines. A straight line was drawn on the left side of the original. Points LL1 and UL1 were carefully marked on this line. These would serve as the Lower Left and Upper Left corners of the first data base (AREA 1). LR1 and UR1 were marked to define a rectangle, and the rectangle drawn around AREA 1 on the original. A point on the straight line was marked as UL2, a point UR2 was marked to define AREA 2.

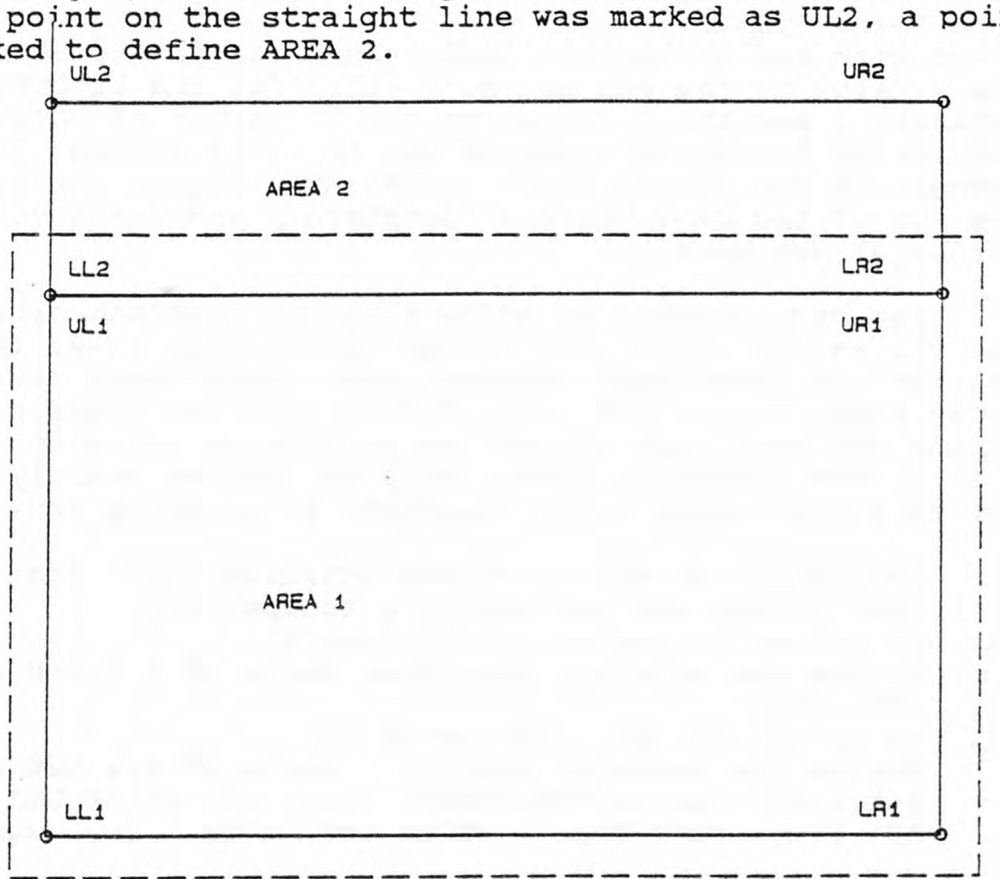

Figure 6. Map vs. Digitizer

By setting up in this way, area 1 could be digitized using a data base with corners UL1,LL1,LR1, and UR1; area 2 could be digitized using a database with corners UL2, LL2, LR2, and UR2.

By making UL1 and LL2 the same point, and having UL2,LL2, and LL1 on the same straight line, databases 1 and 2 can be precisely merged.

A workable procedure would follow these steps:
1. With Area 1 inside the active area of the digitizer, open database 1(here named DB1); digitize all data in Area 1.
2. Move the copy on the digitizer so that area 2 is inside the active area of the digitizer; open database 2(DB2); digitize all data in Area 2.
3. Plot and check results for both areas.
4. Make backup copies of both; use backups for all subsequent steps *XI. Record the values for the corner coordinates for both databases for reference.
5. Invoke GSDASC to make an ASCII file containing the corner coordinates and header data for DB1 (no data Enter CODE **0** at the prompt for codes to be included to return the system to the DOS prompt. This program will create a file named DB1.ASC
6. Change the name of the resulting ASCII file from DB1.ASC to DB3.ASC
7. Use a word processing program to edit DB3.ASC; the purpose will be to change the values for some of the corner coordinates to make a database large enough to include all of Area 1 and Area 2.
Start with the UL corner; leave the X coordinate as 0.0, change the Y value to the sum of the Y value for the UL corner of database 1 and the Y value for the UL corner of Database 2; do not modify the coordinates of the LL or LR points; for the UR corner, do not change the X coordinate, change the Y coordinate to the sum of the UR Y value of database 1 and the Y value of the UR corner of database 2.

You have created an ASCII file for a GSDRAW data base that has UL2 as its upper left corner, LL1 as its lower left corner, LR1 for its lower right corner, and a point very near UR2 as its upper right corner (UR2 will differ from the upper right corner of the new data base unless the rectangles defining Area 1 and Area 2 are precisely drawn, with all angles exactly 90 degrees, but this difference isn't important to plotting from database 3.

8. USE ASCGSD to make a GSDRAW database (DB3) from DB3.ASC. *XI
9. Invoke GSDRAW and use option 2 to open DB3
10. Use option 10 and merge database 1
    Follow the prompts, specify a scale of 1,1 and offset 0,0 (X=0,Y=0)
11. Use option 10 again and merge DB2
    Follow the prompts, specify a scale of 1,1 but offset this database; use XOFF=0,YOFF=Y value for point UL1 in data base DB1 (You wrote that Y value down a few lines ago)

This procedure creates database DB3 large enough to accommodate both Area 1 and Area 2; puts data from DB1 where it belongs covering Area 1, and puts data from DB2 where it belongs covering Area 2.

IF the straight line at the left side of the diagram is truly straight, the procedure described here will produce a merged electronic data base (DB3) with DB2 and DB3 put together to an accuracy of about 1/100 inch - the accuracy of the digitizer, resolution=1/1000", accuracy=1/100"

The game began simply enough. With a question answered with a definite ?. The game was to be played on the board, but the rules were new. Could digitizing be done in such a way that the x,y values for a point would provide values in the map coordinate system used in Portugal? A search for clues provided the following information. The map coordinates used in Portugal are a Cartesian set of X,Y values. A north-south line at 0 degrees of longitude is used as the Y axis. Somewhere south of the PORTUGUESE coast, a point on this line was defined as the origin (0,0), X,Y coordinates. Y values are positive north of that point, X values are positive east of the Y axis, negative west of this axis. X and Y are measured in kilometers. The X,Y values for the grid shown on base maps at several different scales provide the distance in kilometers north and east of the origin. Coordinates for a point, for example, a point where a sample for chemical analysis was taken, were to be expressed in X,Y values. A quick check of some typical base maps at 1:25,000 scale showed that latitude-longitude values were provided for only two points.

Lacking three, THE GSMAP GAMBIT was doomed from the start. Besides, PORTUGUESE coordinates were desired, not latitude/longitude values.

The base maps used the Gauss map projection. A check of Snyder, U.S.G.S Bulletin 1532,1982) showed that this probably corresponded to Transverse Mercator. Another check showed that the grid lines on the base map were indeed perpendicular, and that the scales for the X and Y coordinates were the same.

Soon after a quick trip down the yellow brick road, and a tweak of the source code for GSDRAW, faint strains of Kreutzer One were heard in the Hall of Heroes. And the PORTUGUESE defense was in place. Caution: the PORTUGUESE defense can only be used with GSDRAW Versions 3.03+ and higher. It exploits an X,Y-scaling algorithm not used in previous versions. *ASCGSD is needed .

The procedure is simple enough. Four points on the grid near the corners of the base map were chosen to be the index points for later digitizing. After these were clearly marked on the map. The X,Y coordinates of these points in the PORTUGUESE system were read from the map, and written down in in the sequence that would be used for later data entry in GSDRAW, Upper Left (the northwest point), Lower Left (south west), Lower Right (southeast), Upper Right (northeast).

Next, a file named PORT.ASC was started (using a word processing program. The file was written in the format used by ASCGSD (see *Documentation).

With the paper providing the PORTUGUESE Map Coordinates for the four corner points clutched in the left hand, the right index finger was used to type in the X and Y coordinates for the UR, LL, LR and UR coordinates to match the values read from the PORTUGUESE grid. After saving the changes made to PORT.ASC, the program ASCGSD was invoked. At the prompt, PORT.ASC was specified as th GSDRAW data base, with X,Y values for the index corners and the eight points as entered. GSDRAW was then invoked, and the database PORT was specified; a quick check of the contents of the database using option 7 (code -1) verified that the X,Y coordinates for the corners and for the eight points entered had been accurately set. The stage was then set for the PORTUGUESE defense. Using option 3, and following the prompts on screen, the digitizer board was synchronized with the computer and the four corner points used to index the map to the digitizer board. A high pitched tone announced that digitizing could begin. At this point, all of the normal rules of GSDRAW were in effect. Codes in the 100-199 groups were used to digitize sample localities. Why this group ? Any code could be used ? Anticipation of the end play for the game suggested that if these points were sample points, could an ASCII table containing chemical analyses be too far in the future ? Symbols and posted numerical values probably would be needed, and maps with locality numbers posted might be useful. Although completion of this game awaits reporting of chemical data, the stage for computer generated maps using PORTUGUESE map coordinates has been set by the PORTUGUESE defense.

A few more details about the procedure described. The entry procedure makes the coordinates of the corners mathematically exact (in the PORTUGUESE system).

If polygons are digitized, and areas of polygons computed (option 11 of the Main Menu), the areas calculated will be provided in square kilometers, not the square inches as labelled on printouts. The scaling routines work backwards to calculate square kilometers because you put the coordinates of the corners in that way, using the map coordinates recorded in the **PORTUGUESE Map Coordinate** system.

Other Applications for GSDRAW scaling using

Although described for maps of Portugal, the procedures above can be used to digitize on any rectangular grid system **IF** the X and Y scales are the same. It won't work if the grid is not rectangular or if the X and Y scales are not the same. GSDRAW Versions 3.03+ or higher, please. Mine coordinate systems come to mind as an immediate application.

A note of **WARNING** should be added. If you re-scale a database, you must appropriately modify the scale of plots. A 10-inch dimension on a drawing changed to 1,000 to suit an external grid requires dramatic changing of plot scale; a 1:1 drawing is achieved by a plot at 0.01,0.01 scales; remember that the sizes of symbols and letters will be be drastically reduced by a .01 size plot. Remember that PARA2 can be reset **GLOBALLY** by GSDRAW Version 4.0

The coordinates for points and lines can be obtained from listings (Option 7), or by creating an ASCII file from the data base using GSDASC.

WIZARD'S GAMBIT DECLINED, COUNTERGAMBIT AFTER DUKAS, 1897.

The triangle game has been played by all who use ternary diagrams. As an example, let's assume that you have plotted chemical data for your rocks on a ternary diagram, and now want to see where your points fall in fields invented by an Infamous Petrologist. Naturally the diagrams aren't at the same scale. Further, this Petrologist uses data points for unpublished analyses to support his contentions.

How can you easily and accurately plot his points on your diagram, and plot his fields on the same diagram as your data ?

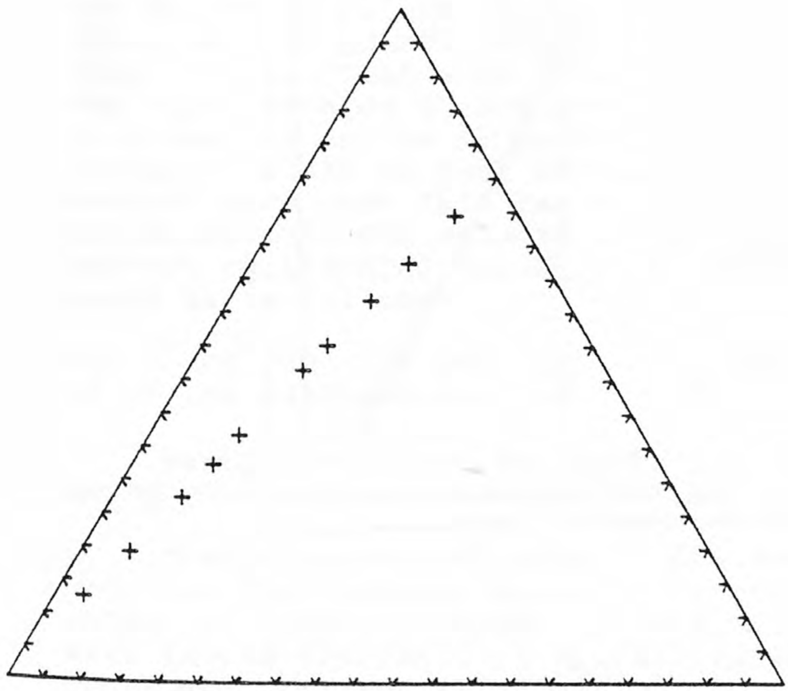

Figure 7A. Yours

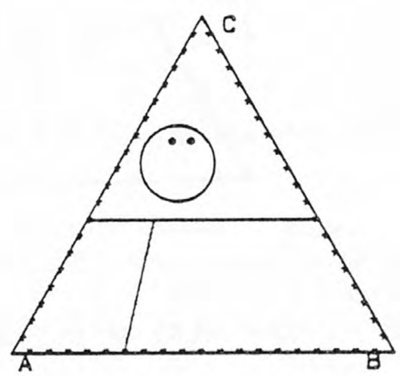

Figure 7B. His

For the sake of simplicity of explanation, let's assume an equilateral triangle with corner on the left labeled A, the corner on the right labeled B, the top corner labeled C. Remember that corner points usable by a single GSDRAW data base can be scaled, as long as proportions and shape remain the same.

A winning strategy for the triangle game was devised early, the Wizard's gambit

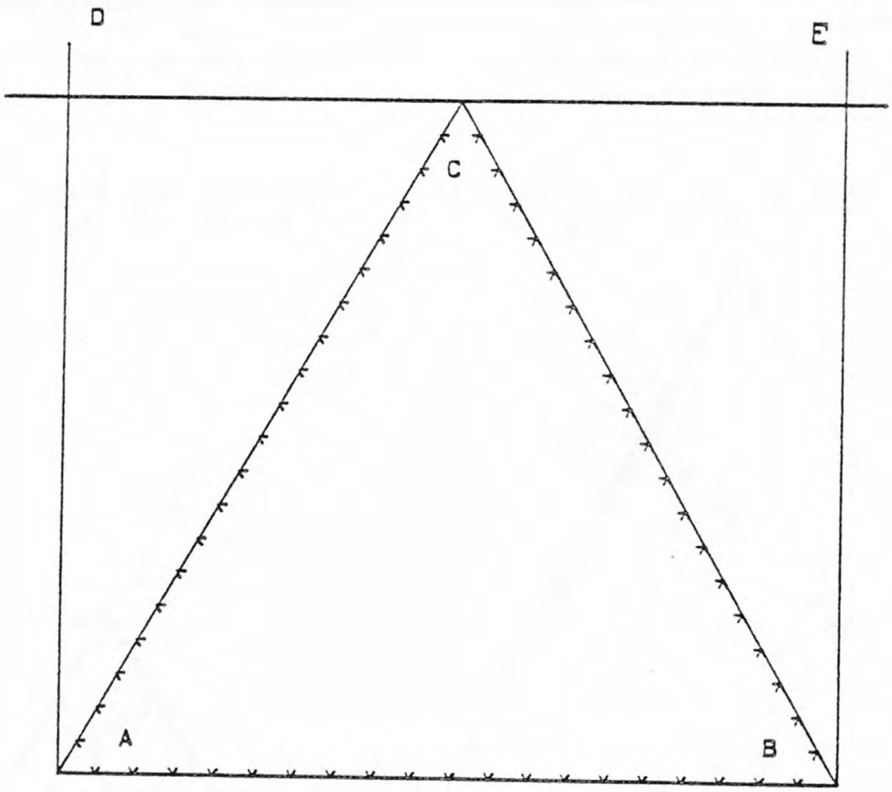

Figure 8. The Wizard's gambit diagrammed

The Wizard's gambit follows this procedure: Draw a line A-B connecting points A and B; draw a second line A-D perpendicular to A-B; through point A; draw a third line B-E perpendicular to A-B through point B, draw a fourth line parallel to A-B through point C. Name the intersection of this parallel line with A-D, point D; name the intersection of this parallel line with line B-E point E. A rectangle is defined with shape familiar to all practitioners of the black art of GSDRAW. Further, points D,A,B,and E, in that sequence define reference points UL, LL, LR, and UR for a GSDRAW model that can be used (regardless of size), to digitize points and lines from your plot and from the plot of the Infamous Petrologist. This works.

More on digitizing Ternary diagrams using GSDRAW

But don't you agree that the use of a pencil and drafting tools lacks elegance in this digital age? Further, how do you compute the analytical values for his unpublished data points? It can be done, but it's a bit complicated because the values for X and Y contained in the GSDRAW database are dependent on the size of the triangle used to set up the data base.

The countergambit after Dukas 1987 is more elegant and makes winning the game a bit easier.

(Throw away your pencil)

Use corners A, B, C, and A as the corners of a GSDRAW database, UL, LL, LR, and UR, in that order. You may assert that the figure A-B-C-A is a triangle, one corner visited twice ! and doesn't provide the four points needed by GSDRAW. Right? Wrong !

Remember that according to the black arts of GSDRAW, vertical is defined by GSDRAW as the line connecting the UL and LL points. The UL and LL points define the Y scale, the LL and LR points define the X scale. Turn your head and look from B to A. That's up (increasing Y from 0 at B; X increases to the right towards C. Now create a GSDRAW database using A as the UL corner, B as the LL corner, C as the LR corner and A as the UR corner. GSDRAW is hell on wheels in determining X and Y, but doesn't care that this rectangle is a triangle. Examine the coordinates of the corners of the GSDRAW rectangle. For a perfect equilateral triangle 10 inches on a side, the coordinates would be as follows:

UL	00.000	10.000	LL	00.000	00.000
LR	8.660025	5.000	UR	00.00	10.00

Next, use GSDASC to create an ASCII file. Edit the file using your word processing program.

Change the coordinates to the ones shown above. Why? Don't you want the Infamous Petrologist's numerical values ? Now use ASCGSD to create a GSDRAW database from the edited ASCII file. Next invoke the magic of GSDRAW and use option 2 to open the previously created data base. With the triangular diagram of the Infamous Petrologist firmly affixed to the digitizer, use this GSDRAW database; index the drawing to the digitizing tablet, use A as the UL corner, B as the LL, C as the LR, revisit A and use it as the UR corner. Now digitize the lines defining the fields you need, and digitize the points you want. When you are through, use 999 to end the digitizing session. Use option 2 to again open the data base, affix your diagram to the digitizer board, use option 3 to start another digitizing session, index the digitizer to your ternary diagram, and digitize your points. Use a different code, naturally, so your data and his don't get confused. After digitizing, plot your data, his data fields, and his data points. Now all the data are on a single plot (Fig. 9).

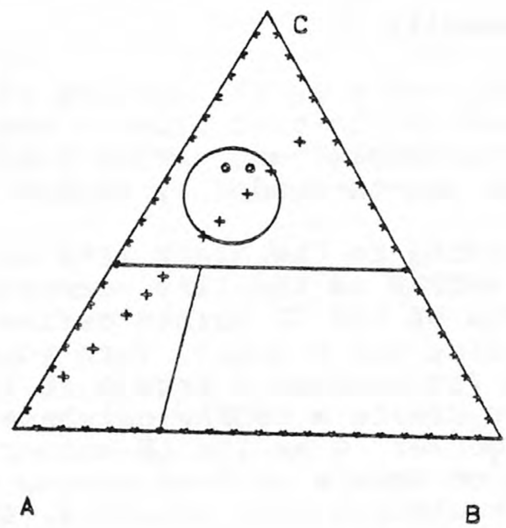

Figure 9. The final diagram.

The Dukas (1897) countergambit may be preferred to the Wizards gambit for three reasons: it requires no construction lines, its 10 inch side enables easy selection of X and Y scales for plots to precisely match the best ternary graph paper you have (so that you can directly read the A, B, and C values for data points), and because this counter gambit reminds one of some of the arcane rules of GSDRAW. For example, for lettering to be drawn properly, a rotation angle of -90 degrees must be specified. Remember that by setting the dimensions of the triangle as recommended here, you specified that the triangle had a 10 inch side; scale your plots accordingly. Set plot areas "windows" using the B key (see *Documentation to plot diagrams like the ones shown here with the A and B corners labeled outside the corner points. Remember that the plotter plots data inside "clip" limits set by the maximum and minimum values for X and Y for the database corners. You can digitize outside these limits at any time. You can plot data outside these corners using the "window" set from the digitizer.

These gambits for the triangle game may be useful to you. When you play DUKAS, 1897, think about triangles that provide four corners, and other ikons of the black arts.

GSDRAW - TO FENESTRATE THE ENDGAME

The screen windows set during digitizing in GSDRAW, using the B key and entering the LL and UR corners, are preserved as plot windows for as long a time as the GSDRAW session using a particular database has not been interrupted. This "feature" permits selection of a particular rectangular section of a drawing from the digitizer so that it alone will be plotted. During a digitizing session, the B key is used to start windowing, the cursor is moved to the lower left corner of the desired window, the 0 (zero) key is pressed, the cursor is then moved to the upper right corner of the desired rectangular window, and the 0 key pressed; these two points define the window displayed on the screen, and define the window for plotting. The algorithm used is based on clipping lines at values where the X or Y coordinates are less than the X,Y coordinates read by the digitizer at the lower left corner of the window, and clipping lines and points where the X or Y values are greater than the X,Y coordinates of the upper right corner of the window.

The effect of a permanent window can be attained using GSDTRIM for GSDRAW data bases; GSMTRIM for GSMAP data bases. These programs copy digital data inside a trim border (see *documentation) into a new data base.

DELETING THE DELETED.
Making deleted entries really go away for ever.

The "Delete option" of both GSMAP and GSDRAW changes the index file so that the "deleted" entry will not be plotted, but it does not modify the data file. If there is reason to get rid of these deleted entries, such as to reduce the size of the data base, you can easily do so. Caution: the line numbers of entities higher than the "deleted" entity will be reduced. The programs GSMASC, GSDASC, GSMSUB, and GSDSUB do not extract deleted entries. In the process of operation, these utilities create new data bases and the deleted entities really go away.

Bringing order to a large GSMAP data base; GSMSUB

The time needed to plot a large map can in many cases be reduced and ink-pens kept flowing better by restructuring the data base using GSMSUB. This program can be used to create a new data base containing only needed entries, and structured to put all codes of a single type together, and grouped (perhaps) so that a fine pen can be made to draw continuously, rather than being parked while another pen is used. This kind of structuring isn't very important until final plots made with technical pens on Mylar are needed. It may make the process of drawing final maps much easier. As GSMSUB drops deleted entities, it reduces the time required to read the index file as the computer searches for entries with the desired code. The sequence of entries in the new and restructured database is specified at the time of using GSMSUB.

GSDSUB does the same task for GSDRAW databases, but these are usually small enough that reordering and removal of deleted entities isn't necessary.

Mirror, Mirror and a scale of -1

When one database is merged with a second, X,Y offsets and X and Y scales must be specified; positive or negative scales can be used. A small exercise that helps understand what happens might be the following. Set up a GSDRAW database 5 inches square. For this example, after opening the data base, the word mirror in script was digitized using code 1, then a single point was used (code 500) to plot "Mirror" from an ASCII file.

Two merges finished the exercise.

1. The database was merged with itself using Xscale=-1 Yscale=1, XOFF=5 YOFF=0. The use of a -1 scale as Xscale causes generation of new data with the line between the LL and UL corners acting as a line of symmetry; the XOFF specified moves this data into the 5 by 5 box. The second stem merged the resulting database with itself, using an Xscale=1, Yscale=-1, XOFF=0, YOFF=5. This causes mirroring across the line of symmetry perpendicular to the UR and LL corners, and the offset brings the new data back into the 5 by 5 box. The figure below is the result; this indicates mirroring of points and lines. but although the point specifying the position of plotting the word designated by the 500 code moves to its proper mirrored position, the word itself is printed to the right of the point in all cases, so that the mirroring seems imperfect.

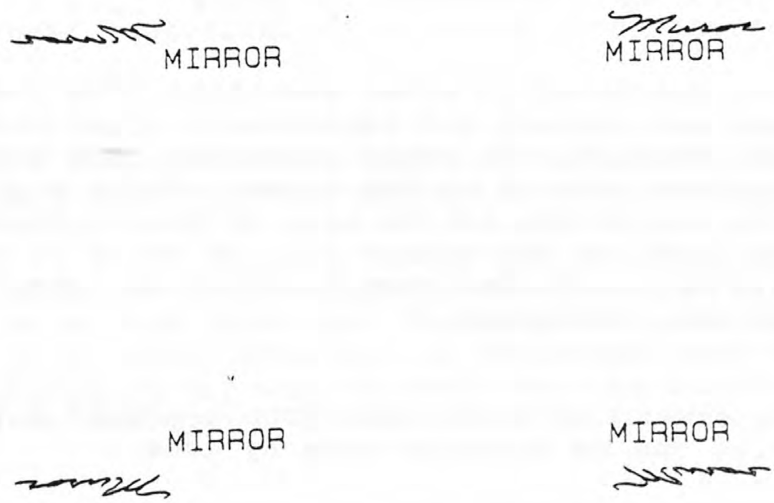

Figure 10. Mirrored codes 1 and 500.

ARCHMAGE
A wizard important enough that he doesn't write documentation for his programs.

ASCGSD Program to create a GSDRAW data base from an ASCII file.

ASCGSM Program to create a GSMAP data base from an ASCII file.

ADVERTISEMENT
A list of references, like the one in this report featuring papers by the authors. At least our label is honest.

BOOT
Used here to describe the process of loading the operating stem into the computer. The word is supposed to come from "bootstrap", as in lifting yourself by your own. This derivation would be worthy of this glossary.

DISCLAIMER
The statement on the first page of an Open-File Report, or on the first screen seen when running a program that puts all responsibility back on you. Just like a wizard to do that.

DOCUMENTATION
The systematic description of a program and how it works. The word is always preceeded by a pejorative adjective or followed by a negative clause, like "it won't win a Pulitzer Prize". Never read documentation, or at least never admit to having read the documentation. Use it for reference only if a Guru or Wizard is unavailable, or angry.

ENTER
If you are asked to enter something from the Keyboard, type the letters and numbers and immediately after strike the Enter key; if you are asked to enter something from the keypad press the appropriate buttons on the keypad of the digitizer cursor while it is within the active area of the digitizer board (the little red light on the cursor will be on if it's in the active area). This definition only applies if the computer and digitizer have first been turned on.

GSDASC
Program to create an ASCII file from a GSDRAW data base.
Entries can be selected code by code.

GSDSUB
Program to create a new data base from a GSDRAW data base with entries selected Code by Code.

GSDTRIM
Program to create a new GSDRAW data base by trimming out the part of a GSDRAW data base inside a digitized polygon.

GSMASC
Program to create an ASCII file from a GSMAP data base.

GSMSUB Program to create a new data base from a GSMAP data base with entries selected Code by Code.

GSMTRIM
Program to create a new GSMAP data base by trimming out the part of a GSMAP data base inside a digitized polygon.

GURU
A person believed by someone else to know more about a program,than he does

HIM
Sorry about the sexist term, but please take no offense; the awkwardnesses of inclusive language are avoided in this Ms by assuming that the reader will supply the missing gender, if desired.

HORSESHOE NAIL
Carriage return. The lack thereof can create problems at the end of a plot file, or one too many (a blank line at the head of a plot file) can create different problems; either is hard to spot on the screen.

INFINITE LOOP
See, loop, infinite.

JUMPSTART
The educational equivalent of a cup of strong coffee, two sugars, and no cream.

LOOP, INFINITE
See, Infinite loop. It's easily entered if ASCII files used in GSDRAW/GSMAP procedures have incorrect punctuation.

SOURCE CODE
The source code for GSMAP, GSDRAW, and the utility programs is included on the source code disk. Warning. If the source code is altered, even by one character, the Wizard is no longer responsible in any way. Do not risk the wrath of a Wizard by asking for debugging of altered SOURCE CODE.

SPLINE
As in splined lines, CODES 600-699. A sort of curve fitting done by the computer to draw smoother curves. It adds points to the ones you digitize to make people think you did more work than you really did. If you aren't careful the computer will throw you a curve that's different than the one you expect (just to get its pound of flesh).

Wizard

The person who knows the most about a particular program, including detailed knowledge of the SOURCE CODE.

XI

<u>The eleventh commandment. THOU Shalt make backups</u>!

The following references constitute a listing of programs and documentation supporting or using GSDRAW and/or GSMAP

Selner, G.I., and Taylor, R.B., 1987, GSDRAW and GSMAP Version 4.0: Prototype programs for the IBM PC or compatible microcomputers to assist compilation and publication of geologic maps and illustrations: U.S. Geological Survey Open-File Reports. Documentation 87-496A, Executable Program disk 87-496B, Source code disk 87-496C, Utility program disks, 87-496D. Tutorial:About GSDRAW and GSMAP, 87-496E

Selner, G.I., and Taylor, R.B., 1987, GSPOST Version 1.0: A program To plot symbols and post numerical data from ASCII tables on regional scale maps using an IBM PC (or compatible) microcomputer and plotter. U.S. Geological Survey Open-File Report, Documentation 87-127A, Program disk 87-127B. Program draws latitude/longitude coordinates, alphanumeric locality identifiers , and numeric data from a row-column ASCII file, plots symbols at localities, and/or posts numeric data based on user-specified class intervals within a specified column. Digitizer not required.

Selner, G.I., and Taylor, R.B., 1987, GSLITH Version 1.0: A program to draw cross sections and plot plan views from regional scale drill hole data using an IBM PC (or compatible) microcomputer, digitizer, and plotter: U.S. Geological Survey Open-file Report, Documentation 87-126A, Program disk 87-126B. GSLITH builds a database by digitizing locations of wells or other localities where data is available on the vertical sequence of units; requires keyboard entry of well elevation, depth to top and bottom of units. User defines plotter pattern/pen for each unit; selects latitude longitude-defined points for beginning and end of line of cross section, width of zone from which to project well plots to the section, program projects wells to the line of section and plots units in wells at true elevation or adjusted so that a chosen contact is plotted at a selected elevation; program also draws horizontal slices through the wells at a selected elevation on areas defined by latitude/longitude corners using circles filled using plotter patterns to show units intersected.

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