

cartographic techniques

IMAGESETTING IN DESKTOP MAPPING

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In a previous contribution to *CP* (Mattson 1989) I stated that "High-resolution PostScript output devices now afford the ability to generate color-separated, plate-ready negatives direct from the designer's desktop." The devices I was referring to are called *imagesetters*. Imagesetters are like laserwriters insofar as they transform PostScript programs into bitmap images. But unlike laserwriters, most of which affix black toner to plain paper at about 300 dots per inch (dpi), imagesetters use laser beams to expose photosensitive films and papers at resolutions up to 3,000 dpi. Another important distinction between laserwriters and imagesetters is price. The average cost of 23 models cited in Steve Roth's useful article "The Imagesetter Explosion" (*Macworld*, February 1990) is \$67,500. Obviously, many smaller cartographic design and production facilities will not soon be able to acquire their own imagesetters, but those which use desktop mapping techniques will certainly have to deal with imagesetter service bureaus to get high quality output.¹ This article presents what we have learned about imagesetting at the Temple Cart Lab since we installed a Linotronic L-300 in January 1990. It is intended to be of use both to prospective purchasers and service bureau clients.

Imagesetters are composed of two units, a *raster image processor* (RIP) and an *imaging engine* (Figure 1). PostScript files are transmitted from the desktop workstation to the RIP to be translated into bitmaps by

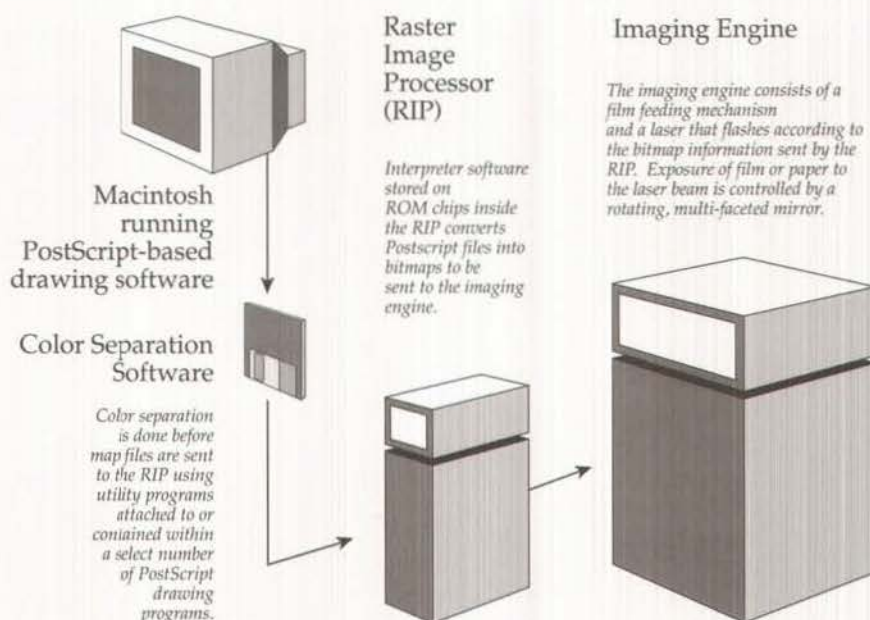


Figure 1: The imagesetter as part of the complete desktop mapping system

PostScript interpreter software. The RIP also contains a hard disk on which fonts are stored together with buffered print jobs. The imaging engine is the device that finally puts dots on film or paper through a series of on/off flashes from a laser beam. Cartridges of exposed paper or film are removed from the imaging engine and developed by an automatic film processor.

As Roth points out, the Linotype corporation enjoyed a monopoly on the laser imagesetter market for the first two years of the desktop publishing revolution. Today at least nine manufacturers² offer models which rival and in some ways may surpass Linotype for cartographic production.

To decide between alternative vendors and models, we first considered the requirements of the products we intended to produce. Not all imagesetters do all jobs. A model that is satisfactory for one organization may prove totally inadequate for another. The Temple Cart Lab, for example, needs a machine that produces color-separated film comprised of tint and halftone screens at screen frequencies of at least 120 lines per

inch (lpi). A group like our University Publications Office, which typically runs 'repro' (simple paper products comprised of type with no tints or area fills) could do nicely with a less elaborate, relatively inexpensive imagesetter.

Comparing performance and service features of the various models is the second step in selecting an imagesetter. The most important features include PostScript compatibility, image resolution, page buffering, image accuracy, and reliability and service support.

PostScript compatibility

One of the reasons that we chose Linotype was that we were very concerned about compatibility between the imagesetter and the current crop of desktop publishing software packages and PostScript fonts. The Linotronic series is one of five imagesetters lines using licensed Adobe PostScript RIPs. Other machines use RIPs with 'cloned' (non-Adobe) PostScript interpreters. Roth (1990) gives clone interpreters a left-handed endorsement at best, stating that "... PostScript clones ... are now

Manufacturer	Price	Resolution	PostScript Interpreter	Adobe Fonts	Page Buffer	Film Width
Agfa Compugraphic						
CG9400-PSTD	38000	1,200, 2,400	Adobe/Compugraphic	Yes	Yes	13 inches
CG9600-PSTD	61000	1,200, 2,400	Adobe/Compugraphic	Yes	Yes	13 inches
CG9700-PSTD	79000	1,200, 2,400	Adobe/Compugraphic	Yes	Yes	13 inches
Autologic						
APS-PS-PIP-W/670S	60000	1016	Adobe/Autologic	Yes	Yes	12 inches
APS-PS-PIP-W/680	118000	1000	Adobe/Autologic	Yes	Yes	13.3 inches
APS-PS-PIP-W/108S	107000	1016	Adobe/Autologic	Yes	Yes	18 inches
Linotype						
L-200B	35000	635,846,1270	Adobe/Linotype	Yes	No	12 inches
L-300	60000	635,1270,2540	Adobe/Linotype	Yes	No	12 inches
L-500	80000	635,1270,1693	Adobe/Linotype	Yes	No	18 inches
Monotype						
Express 100	89500	1000	Adobe/Monotype	Yes	No	16.6 inches
Pioneer 70PS	79000	1000,1500	Adobe/Monotype	Yes	No	11.7 inches
Prism PS	39000	600,1200,2400	Adobe/Monotype	Yes	No	11.7 inches
Varityper						
4200B-P	35000	900,1800	Adobe/Varityper	Yes	Yes	11.7 inches
4300-P	54000	1200,2400	Adobe/Varityper	Yes	Yes	11.7 inches
5330	66000	1524,3048	Adobe/Varityper	Yes	No	12 inches

Table 1: Imagesetter vendors and models using licensed Adobe PostScript interpreters. Source: Roth (1990).

getting to the point where compatibility is a lesser concern" [my italics]. He goes on to say that Adobe interpreters are "still more reliable — especially with very large files containing scanned images." Some clones can't yet download Adobe fonts. Even though "makers of clone-based RIPs are catching up fast", we felt that it was prudent to go with an interpreter engineered by the organization that invented PostScript. Currently only five manufacturers feature RIPs that are controlled by Adobe designed boards (Table 1).

Image resolution

Besides the pedigree of their PostScript interpreters,

imagesetters vary primarily according to *resolution*. Resolution is defined as the number of addressable points that are contained across the 'x' axis of one square inch. Obviously, as the number of addressable points increases, so does the resolution of the image. A good way to think about this is to imagine a picture in a newspaper and compare that picture to one of the spectacular panoramic shots in National Geographic magazine. The essential difference between the two, aside from color, is resolution. The newspaper shot is so coarse that the dots making up the image are visible without magnification. In the National Geographic shot the resolution is fine and the dots

that make up the image are practically invisible from normal reading distance. Figure 2 is a simple demonstration of this concept.



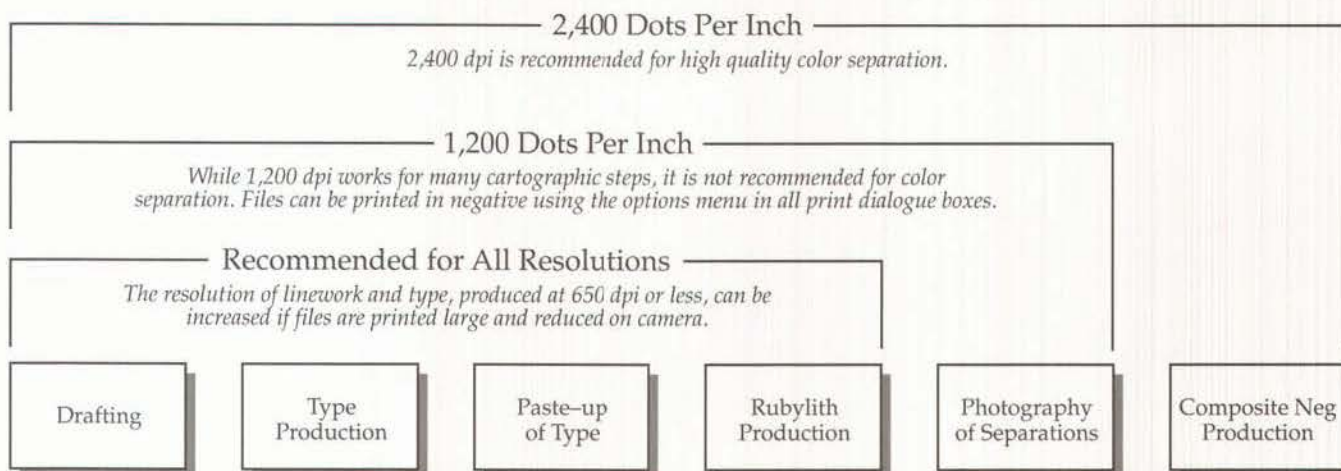
72 dots per inch



2,540 dots per inch

Figure 2: The quality of imagesetter output depends largely on resolution

POSITIVE MODE CONSTRUCTION OF MECHANICAL SEPARATIONS



NEGATIVE MODE CONSTRUCTION OF SEPARATIONS

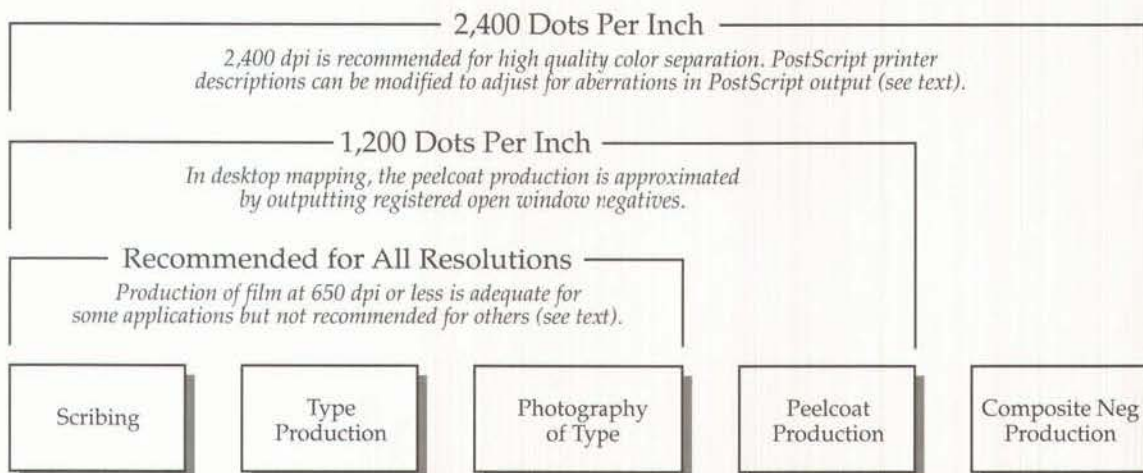


Figure 3: Acceptable imagesetter resolutions for cartographic production tasks

The resolution that can be achieved with today's imagesetters can be categorized in three levels: low (600 dpi), medium (1,000 to 1,240 dpi), and high (2,400 to 3,000 dpi). Figure 3 illustrates the relationship between resolution categories and tasks in a simplified cartographic production flow. The figure shows which tasks can be accomplished satisfactorily at various resolution levels.

In the context of a complete desktop mapping system in which cartographic projects are developed in digital form from design to

composite film, an imagesetter — purchased or hired — must be able to deliver 2,400 dpi and above. Cartographers intending to stop somewhere short of composite film can rely on machines generating 1,200 dpi and less. Open window negatives, for example, can be obtained from imagesetters that produce film at 600 to 1,270 dpi. Linework and type can also be generated satisfactorily at these levels (even 300 dpi plain-paper laserwriters can do wonderful work in a traditional production context, particularly if artwork is

produced upscale and reduced in a process camera as a way of increasing resolution).

Page buffering

All machines pass film or paper past a light source for exposure. The best products come from imagesetters that do this without interruption. When interruption does occur, streaks or 'artifacts' appear on the output. If the RIP cannot work as quickly as the imaging engine to which it is attached, the engine must stop to wait for information. This 'stop-

ping' is physically manifest as streaks in areas of uninterrupted tint screens. *Page buffering* is a process which guards against engine stoppage by delivering entire imaging jobs that have been placed in short term storage. Table 1, and the product option table in Roth (1990) indicate which models offer this feature.

Image accuracy

One aspect of quality in imagesetting is replicability. The measurement of replicability — known as *image accuracy* — is extremely important to desktop map-makers because it relates directly to the registration of film separations. Image accuracy is a function of the precision with which film or paper is mechanically tracked past the laser for exposure.

When we started experimenting with desktop mapping at Temple we hoped to use the Macintosh to help produce our *Atlas of Pennsylvania*. The registration of the tests that came back from our imagesetter service bureau varied so wildly that we almost gave up the idea of using desktop mapping entirely. We saw variations of as much as a quarter of an inch across a twelve inch sheet. But by changing to a different service bureau (using a different imagesetter) we solved our problems immediately.

When assessing a piece of equipment be aware that the acceptable tolerance for modern engines is four mils (thousandths of an inch) over the width of a twelve inch product (in reality, a good machine will do even better). Manufacturers' technical description sheets will include image accuracy specifications for specific products. Plan also to design a test graphic using drawing software with color-separation tools (like Adobe *Illustrator* or Aldus *Free-Hand*) when interviewing potential service bureaus. Prototyping can save hours of aggravation and lost

funds due to image accuracy problems.

Reliability and service support

The imagesetter industry is young: the first PostScript imagesetter was introduced by Linotype at the Print '85 trade show, and alternatives to the 'Lino' have only become available in the past year or two. Vendors just entering the imagesetting market simply lack what we perceived to be 'hours on the job.' We worried that we might fall through the cracks of some evolving developmental cycle. This is not to say that such a cycle might not deliver a splendid result in a few years, but we couldn't afford to be \$75,000 guinea pigs.

In our effort to assess service support we tried to look beyond the claims of manufacturers' sales forces. According to them we could expect to have a service technician living in our darkroom twenty four hours a day eating leftover sandwich scraps as his only compensation. What we looked for was on-site endorsements. In this respect, Linotype came up smelling like a rose. In fact, I would say it was one of its strong points.

In day-by-day operation, service on a machine like ours reminds me of the old Maytag commercials. You know the ones: the little roly-poly guy feels left out because nobody ever calls him to fix their machine. For us, that's what it's been like. No service needed. I point this out not as an endorsement of Linotype but as a way of soothing those who might think that lasers are spoiled little beasts that require special attention. One of the most amazing things that we found was that this wonder of technology ran with as few demands as our Apple LaserWriter. Beyond some customized programming which I present later in this piece, the machine has run eight hours a day for eight months

without a single problem.

AMORTIZATION AND COST JUSTIFICATION

We initiated on a two-step strategy to bring an imagesetter into our lab. The first step was to identify an appropriate product. Step two was to develop an air-tight cost justification to convince our central administration that having a high resolution imaging device on campus was an economically prudent and hence fundable idea. Perhaps some of this information will help other cartographers leverage a machine of their own.

At the time of our proposal we had a yearly flow of approximately 2,100 separations to off-campus service bureaus. At that volume, we were paying \$15 per separation for high-resolution (2,540 dpi) film. Prices for output are determined by resolution, product size, and quantity. Resolution and size are the main factors, being related directly to speed of processing. As an example of the relationship between resolution and output speed, we printed Figure 4 on our L-300 at 635, 1270, and 2540 dpi. At 635 dpi, Figure 4 took 6 minutes to output. At 1,270 dpi output time was 10 minutes. At 2,540 dpi, the product was ready for processing in 13 minutes.

In 1989, a typical illustration or atlas page cost us \$60.00 given that the standard presentation required a black, cyan, magenta, and yellow composite printer. An atlas of 240 pages (fifteen 16-page signatures) meant an outlay of \$14,400. Added to this cost was an unavoidable number of AAs (author's alterations) that cost up to another \$2,000 per book to correct.

An imagesetter seemed justifiable given our rate of output. As shown in Table 2, yearly operating costs, if the \$75,000 for the imagesetter was amortized over a five-year period, would run just over \$30,000. Compare this figure

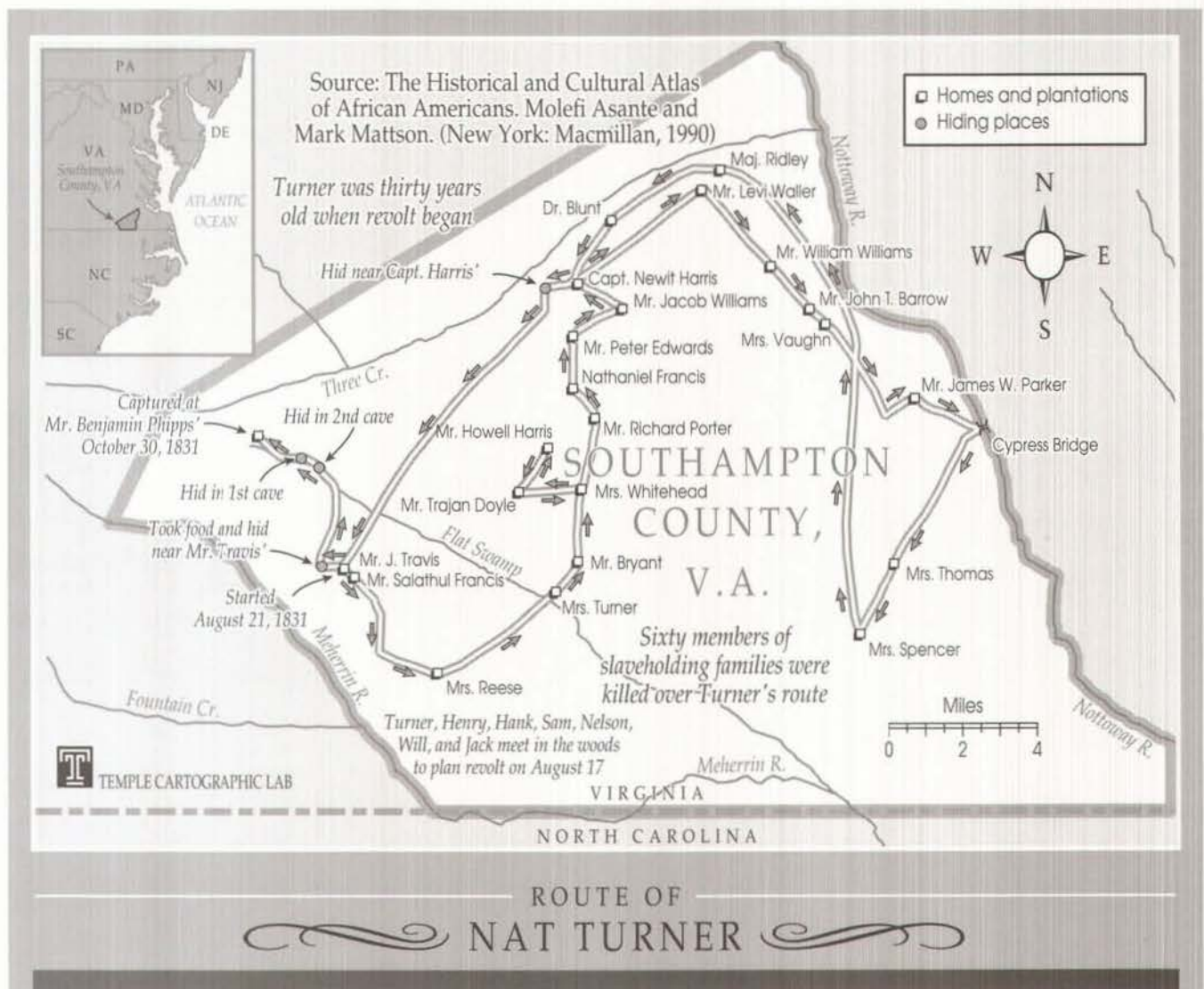


Figure 4: 120Kb graphic produced in Adobe Illustrator 88 used to test imaging times at various resolutions (shown here at 2,540 dpi)

to the \$32,000 we anticipated spending on two atlases a year if we continued to send files off campus.

Materials costs were estimated as follows: one hundred foot, 12 inch wide rolls of Fuji PRF-100 laser film was purchased at an extended price of \$126.40 per roll; Fuji PRH 100WP laser paper was purchased at \$97.00 per 200 foot, 12 inch roll; chemicals cost \$31.00 per week for continuous operation of our DuPont 26C rapid access processor. Also factored into our calculations were maintenance contracts for both our film processor and our laser imagesetter and RIP. L-300

maintenance costs a whopping \$8,000 per year for full, no questions asked service. Processor service is \$1,200 per annum.

Shared services

We could see ourselves breaking even given the preceding scenario, but the proposition was anything but profitable. To carry our strategy forward and to solidify our ideas in the minds of our university hierarchy we needed to justify our expense beyond the mere recovery of costs. To do this we followed the example of an old-time friend and Temple graduate Joe School who currently directs the cartographic lab at the

L-300	15000
Maintenance/L-300	7500
Maintenance Processor	1200
Materials	3120
Chemicals	1553
Operation and Film Processing	1800
Total	30173

Table 2: Estimated annual costs of imagesetter operation

University of Maryland's Baltimore campus. His method has been to share services with other Macintosh-based offices on campus and to use their contributions to maintain an L-100 for his lab's contract work. On his campus, as on ours and many others, Macintosh plays an important role in various publications offices. We saw (and fortunately so did our university president) that we could develop quite a little cash-cow if the whole campus stopped sending work elsewhere and started turning it over to us. Funding for our imagesetter was approved.

COLOR SEPARATION

Color separation refers here to the process of reducing a polychromatic screen image to a registered set of negative films which correspond to the printable component colors of the original. Imagesetters generate plate-ready film separates, but they work from PostScript files that have already been color-separated. Software utilities integrated into or associated with PostScript graphics packages do the actual color-separation. Two leading drawing packages used to generate color-separated graphics for imagesetting are Adobe's *Illustrator 88* and Aldus' *FreeHand*.⁴

Comparing *Illustrator* and *FreeHand*

Illustrator and *FreeHand* do color separation differently. To color-separate an *Illustrator* document, the designer invokes a separate program called *Adobe Separator* (Figure 5). *FreeHand*'s color separation utility is contained within the drawing program, and is accessible through its print dialog box (Figure 6).

A thorough comparative review of the two packages for cartographic design applications has not yet been published. Which program is better for color separa-

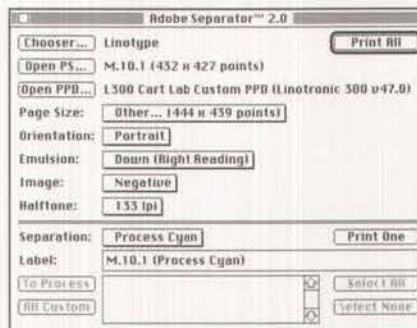


Figure 5: Adobe *Separator* color separation dialog box

tion is a matter of debate. Certainly, *FreeHand*'s on-board utility is easier to use. But with respect to image quality, our experience has shown that *FreeHand*'s output tends to be plagued with banding at certain line frequencies and printer angles. Of greatest concern, in our shop, has been yellow at 133 lpi (it is possible that our problems are site specific).

Precision color-separation and imaging

After generating thousands of color-separated cartographic products at Temple, we have learned that the screen angles and dot frequencies specified in the process of digital color separation are not precisely realized by imagesetters using Adobe PostScript RIPs (Mattson 1989). These imprecisions can result in moiré patterns during the overprinting of dominant color printers. This problem is particularly acute when heavy screens of black (20 to 60 percent) are incorporated into map design in areas that are overprinted with magenta.

It seemed as though these problems were due to inadequacies in the implementation of the PostScript language itself, and Adobe released "workaround specifications" for avoiding moiré problems.⁵ David DiBiase, who has reported good results using *FreeHand* for color separation at Penn State's Deasy GeoGraphics Lab, prompted me to consider that the imprecisions may be attribut-

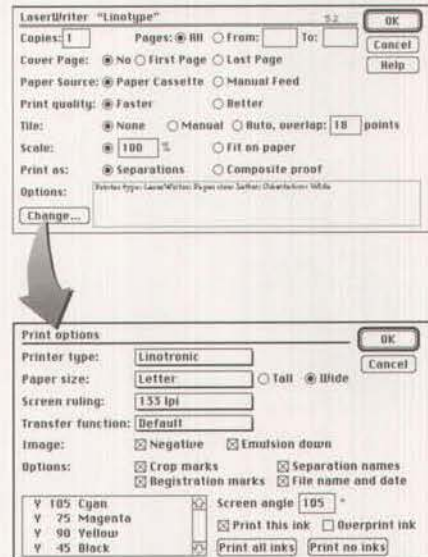


Figure 6: Aldus *FreeHand* 'Print' and 'Print Options' dialog boxes

able to the Adobe's color separation utilities rather than to PostScript itself. To resolve this question I performed an experiment. Identical graphics files were created in both *Illustrator* and *FreeHand*. The *Illustrator* file was also saved in *Illustrator 1.1* format, imported in *FreeHand*, and color-separated with *FreeHand*'s utility. The color separated files were then output on our L-300. The resulting screened negatives were then carefully measured with a 300-power Nikon microscope. Deviations from specified screen angles were gauged with a 1° - increment transparent protractor. We noted deviations of as much as plus or minus 3° between specified screen angles and what was actually imaged. The screen angle deviations were worst for cyan (105°) and magenta (75°) screens separated by *Adobe Separator* at 90 and 133 lpi, and for 120 and 133 lpi screens separated in *FreeHand* (Table 3). The *Adobe* files imported and color-separated in *FreeHand* mirrored the *FreeHand* deviations at 90 and 120 lpi, but matched the *Illustrator* deviations at 133 lpi. Screen angle deviations were identical in all three categories (and smallest) at 150 lpi. In all

	Adobe Separator	Deviation	Aldus FreeHand File	Deviation	Illustrator 1.1 File, FreeHand Separator	Deviation
90 LPI						
Cyan (105°)	102°	-3	106°	1	106°	1
Magenta (75°)	77°	2	74°	-1	74°	-1
Yellow (90°)	90°	0	90°	0	90°	0
Black (45°)	45°	0	45°	0	45°	0
120 LPI						
Cyan (105°)	104°	-1	107°	2	107°	2
Magenta (75°)	76°	1	73°	-2	73°	-2
Yellow (90°)	90°	0	90°	0	90°	0
Black (45°)	45°	0	45°	0	45°	0
133 LPI						
Cyan (105°)	108°	3	103°	-2	102°	-3
Magenta (75°)	72°	-3	77°	2	78°	3
Yellow (90°)	90°	0	90°	0	90°	0
Black (45°)	45°	0	45°	0	45°	0
150 LPI						
Cyan (105°)	104°	-1	104°	-1	104°	-1
Magenta (75°)	76°	1	76°	1	76°	1
Yellow (90°)	90°	0	90°	0	90°	0
Black (45°)	45°	0	45°	0	45°	0

Table 3: Observed discrepancies between screen angles specified in color separation utilities and imaged with Linotronic L-300 imagesetter

cases, screen angles were precisely imaged for the yellow (90°) and black (45°) printers. The average absolute deviation for screen angles separated with Adobe *Separator* is .94°; *FreeHand's* separation utility is slightly more precise overall at .75° average absolute deviation (Table 4). Dot frequencies varied identically for both separators at more than 5 percent at 90 and 120 lpi, but less than 2 percent at 133 and 150 lpi. These results suggest that the precision of screen angles imaged by the L-300 are at least partly a function of the color separation software associated with drawing packages. Dot frequency imprecisions still appear to be caused by a PostScript interpretation problem, which is not likely to go away until 1992 when Adobe introduces PostScript Level 2.⁶ Until then,

PostScript Printer Descriptions (PPDs) customized with correcting parameters will have to serve as substitutes for clean and accurate screen production. The following section presents custom PPD code that may help imagesetter service bureau clients and imagesetter owners to avoid these problems.

PostScript Printer Descriptions (PPDs)

Critical image properties like dot frequency (lpi), screen angle, dot shape, dot density, color, and page sizes are assigned to each PostScript file and are communicated to the imagesetter as a series of instructions known collectively as PPDs. In the absence of a PPD the imagesetter falls back on a series of default parameters which may not match the user's needs. The proper use of PPDs can make

the difference between good and poorly executed products. Adobe *Separator* requires the user to select a PPD for the target printer. Adobe PPDs can be stored in a folder anywhere on the Mac's hard disk, though Adobe recommends that a copy of the appropriate PPD be placed in the same folder or diskette as the graphics file for faster printer performance. *FreeHand* automatically links the appropriate APD (Aldus Printer Description) when a printer is selected in its print dialog box. *FreeHand's* installation routine places its APDs in the Mac's system folder.

Illustrator and FreeHand handling of PPDs

Both *Illustrator* and *FreeHand* offer controls over page description functions. The essential difference

Resolution	Adobe Separator	% Deviation	Aldus FreeHand Separator	% Deviation	Illustrator 1.1 File, FreeHand Separator	% Deviation
90 LPI						
Cyan (105°)	95	5.2	95	5.2	95	5.2
Magenta (75°)	95	5.2	95	5.2	95	5.2
Yellow (90°)	95	5.2	95	5.2	95	5.2
Black (45°)	95	5.2	95	5.2	95	5.2
120 LPI						
Cyan (105°)	127	5.5	127	5.5	127	5.5
Magenta (75°)	127	5.5	127	5.5	127	5.5
Yellow (90°)	127	5.5	127	5.5	127	5.5
Black (45°)	127	5.5	127	5.5	127	5.5
133 LPI						
Cyan (105°)	135	1.5	135	1.5	135	1.5
Magenta (75°)	135	1.5	135	1.5	135	1.5
Yellow (90°)	135	1.5	135	1.5	135	1.5
Black (45°)	135	1.5	135	1.5	135	1.5
150 LPI						
Cyan (105°)	152	1.3	152	1.3	152	1.3
Magenta (75°)	152	1.3	152	1.3	152	1.3
Yellow (90°)	152	1.3	152	1.3	152	1.3
Black (45°)	152	1.3	152	1.3	152	1.3

Table 4: Observed discrepancies between dot frequencies specified in color separation utilities and imaged with Linotronic L-300 separator

	Custom Screen Angle Custom Screen Frequency Custom Page Size Adjustable Dot Size (see text) Adjustable Dot Shape Chooser Access PPD Selection Orientation Image (Positive/Neg) Emulsion (Up/Down) Registration Marks Separation Data File Date File Name													
Adobe Separator	P	P	O	P	P	O	O	O	O	O	A	A	N	A
Aldus FreeHand	O	O	P	N	N	O	O	O	O	O	O	O	O	O

P = Programmed through PostScript language in Printer Description (PPD)

O = Option, controllable through print dialog box

A = Automatic to application

N = Not available for manipulation

Notes: Custom screen angles are anything other than 45° Black, 75° Magenta, 105° Cyan, and 90° Yellow

Custom screen frequencies are those not offered as menu choices within dialog boxes of either program

Custom page sizes are those not offered as menu choices within dialog boxes of either program

Chooser Access means selection of printer through dialog box

Figure 7: Comparison of PostScript Printer Description options using Adobe Illustrator/Separator and Aldus FreeHand

is how they are handled. In each case, certain functions are changed in the separator while others are changed in the PPD code. Figure 7 shows which functions can be controlled from the computer and which functions are controlled through PostScript programming (programming details will be illustrated in the final section). The only functions that can be performed by the Adobe PPD and not the Aldus APD are adjustments in dot shape and dot size. Regarding dot shape, the Adobe PPD can be used to create round, square, or elliptical dots. The APD can not. More importantly, however, is dot size. With certain adjustments to the PPD the amount of black covering each inch can be adjusted.

I would like to use the initial setup of our L-300 as an example of why this is important. When we got our machine, we also bought a \$1500 Tobias TB+ transmission densitometer. We wanted to check whether our negatives were of adequate density and correct screen specifications. If they did not and we were getting a 14 percent tint when we were calling for a 10, our color designs would be unpredictable and in many cases unsuccessful.

As expected, we found that the Linotronic didn't produce a predictably accurate dot straight off the shipping skid and needed adjustment to meet tolerance. We also found out, through hiring a consultant, that the adjustment wasn't on the imagesetter but was instead inside the PPD. As a result, one of our first tasks was to run every dot density from 10 percent to 100 percent for all four process colors to determine how true they were coming straight off the machine. Our second task was to re-program our PPDs to correct for inaccurate dot density.

Customizing PPDs

In some cases, adjustments to

printer descriptions are needed for the reasons described above and can be accomplished through simple programming. I say simple because, like many of our colleagues, we are hardly what anyone could call computer geniuses. We learned to customize PPDs through a method that can be best described 'monkey-see-monkey-do'. Areas that will be covered for *Illustrator* are line frequency, screen orientation, and dot size. Covered for Aldus *FreeHand* and *PageMaker* will be custom page sizes.

PostScript printer descriptions are in ASCII text format and can be opened through any text editor or word processing program. It would probably be helpful if our readers were to open an *Illustrator* PPD now. Each imagesetter needs a PPD designed for it. An L-300 PPD starts with the following header:

```
% L300 CART LAB STANDARD PPD
%
% Adobe PostScript(R) Printer Description File
% For "Lirotype" version 47.0
% Produced by "GETapd.ps" version 2.0 edit 47
%
% Copyright 1988 Adobe Systems Incorporated. All Rights Reserved.
% Permission is granted for redistribution of this file as
% long as this copyright notice is intact and the contents
% of the file is not altered in any way from its original form.
%
% The byte count of this file should be exactly 015357.
%
% Date: 3/30/88
% FormatVersion: "2.0"
% FileVersion: "1.0"
% LanguageVersion: English
```

Further along in the document is a line that reads:

```
% Color Separation Information =====
```

This note starts the section of the Adobe PPD that deals with color separation. Information is organized according to line frequency. A standard PPD starts with 90 lpi and is followed by 120, 133, and 150. In each section, the information is the same. The 133 section looks like this:

```
% For 133 lpi set =====
%ColorSepScreenAngle ProcessCyan.133lpi/133 lpi: "15"
%ColorSepScreenAngle ProcessMagenta.133lpi/133 lpi: "75"
```

```
%ColorSepScreenAngle ProcessYellow.133lpi/133 lpi: "0"
%ColorSepScreenAngle ProcessBlack.133lpi/133 lpi: "45"
%ColorSepScreenAngle CustomColor.133lpi/133 lpi: "45"
```

```
%ColorSepScreenFreq ProcessCyan.133lpi/133 lpi: "133"
%ColorSepScreenFreq ProcessMagenta.133lpi/133 lpi: "133"
%ColorSepScreenFreq ProcessYellow.133lpi/133 lpi: "133"
%ColorSepScreenFreq ProcessBlack.133lpi/133 lpi: "133"
%ColorSepScreenFreq CustomColor.133lpi/133 lpi: "133"
```

```

.
.
.
%ColorSepTransfer ProcessBlack.133lpi/133 lpi: "1"
mark
1.0 1.0 .94 .85 .76 .66 .56 .48 .38 .28 .16 .0
counttmark dup 3 add -1 roll exch
2 sub mul dup floor cvi
dup 3 1 roll sub
exch dup
3 add index exch 2 add index dup
4 1 roll
sub mul add
counttmark 1 add 1 roll
cleartomark
| bind
"
*End
```

The first two sections of the following modified PPD will effect the Adobe "workaround specifications" to correct for imprecisions in screen angle and dot frequency imaging (bold type indicates new specifications). The modified third section is a *ColorSepTransfer* procedure to change dot density for each of the process colors. Keep in mind that only the 133 lpi set needs to be changed to implement adjustments to the PPD. When printing through Adobe *Separator* use the 133 lpi print option:

```
%ColorSepScreenAngle ProcessCyan.133lpi/133 lpi: "72"
%ColorSepScreenAngle ProcessMagenta.133lpi/133 lpi: "18"
%ColorSepScreenAngle ProcessYellow.133lpi/133 lpi: "0"
%ColorSepScreenAngle ProcessBlack.133lpi/133 lpi: "45"
%ColorSepScreenAngle CustomColor.133lpi/133 lpi: "45"
```

```
%ColorSepScreenFreq ProcessCyan.133lpi/133 lpi: "133"
%ColorSepScreenFreq ProcessMagenta.133lpi/133 lpi: "133"
%ColorSepScreenFreq ProcessYellow.133lpi/133 lpi: "127"
%ColorSepScreenFreq ProcessBlack.133lpi/133 lpi: "120"
%ColorSepScreenFreq CustomColor.133lpi/133 lpi: "133"
```

```

.
.
.
%ColorSepTransfer ProcessCyan.133lpi/133 lpi: "1"
mark
1.0 1.0 .88 .79 .69 .59 .49 .40 .30 .21 .10 .0
counttmark dup 3 add -1 roll exch
2 sub mul dup floor cvi
dup 3 1 roll sub
exch dup
3 add index exch 2 add index dup
4 1 roll
sub mul add
counttmark 1 add 1 roll
cleartomark
| bind
```



```

*End
*ColorSepTransfer ProcessMagenta.133lpi/133 lpi: "I
mark
1.0 1.0 .88 .79 .69 .59 .49 .40 .30 .21 .10 .0
counttomark dup 3 add -1 roll exch
2 sub mul dup floor cvi
dup 3 1 roll sub
exch dup
3 add index exch 2 add index dup
4 1 roll
sub mul add
counttomark 1 add 1 roll
cleartomark
I bind
"
*End
*ColorSepTransfer ProcessYellow.133lpi/133 lpi: "I
mark
1.0 1.0 .88 .79 .69 .59 .49 .40 .30 .21 .10 .0
counttomark dup 3 add -1 roll exch
2 sub mul dup floor cvi
dup 3 1 roll sub
exch dup
3 add index exch 2 add index dup
4 1 roll
sub mul add
counttomark 1 add 1 roll
cleartomark
I bind
"
*End
*ColorSepTransfer ProcessBlack.133lpi/133 lpi: "I
mark
1.0 1.0 .94 .85 .76 .66 .56 .48 .37 .28 .15 .0
counttomark dup 3 add -1 roll exch
2 sub mul dup floor cvi
dup 3 1 roll sub
exch dup
3 add index exch 2 add index dup
4 1 roll
sub mul add
counttomark 1 add 1 roll
cleartomark
I bind
"
*End

```

Customizing Aldus APDs

Nearly all Aldus APD functions are conveniently controlled through the *FreeHand* print dialog box. The one area that requires manipulation through language is custom page size. Adding a new APD for a custom page size will allow for the printing of documents larger in size than the options built directly into the program. It will also allow for smaller formats that can be used to crop small images to save processing time and materials (why print a 3"x4" map on a full page when a smaller sheet can be created?).

To add a custom page size go to the section that reads:

```

@Comment: PageSize options appear in the "Paper" list box in the
Printer-specific dialog.
@DefaultPageSize:"Letter"
@PageSize Letter:
"letter"

```

```

@Comment: PageRegion gives the printable area of each paper
option.
@PageRegion Letter:
"0 0 612 792"

```

```

@Comment: PaperDimension gives the total paper size of each
option.
@PaperDimension Letter:
"612 792"

```

Add this new line after:

@PageSize Letter:"letter":

```

@PageSize NewsSize:
"statusdict begin 720 864 0 1 setpageparams end"

```

Also add this new line after

@PageRegion Letter:

"0 0 612 792":

```

@PageRegion NewsSize:
"0 0 720 864"

```

Finally, add this line after

@PaperDimension Letter:

"612 792":

```

@PaperDimension NewsSize:
"720 864"

```

In the preceding example '720' and '864' are the sizes of the new page, in points. Quick arithmetic reveals that we have created a custom page size that is 10 by 12 inches. To use the custom page size click "change" in *FreeHand's* print dialog box. Then select the new APD from the "Printer type" scroll box and the new paper size from the "Paper" scroll box.

Comments

Never modify original PPDs or APDs, only copies. Add only the lines specified above. Never exceed the maximum size of the imagesetter. Also be aware that commands having to do with page orientation that are infused into the original file will be overridden in Adobe *Separator*. In other words, if landscape orientation is specified in *Illustrator* and landscape is used in *Separator* the

map will turn a second time and end up in a portrait mode.

CONCLUSION

Whatever vendor and model, whether through a service bureau or in-house, the PostScript imagesetter is a critical part of the complete desktop mapping system. Coupled with color separation utilities and PostScript drawing packages, this device supplants traditional photomechanical methods for high-quality, color thematic map design and production. ☐

NOTES

1. An annual directory of PostScript imaging service bureaus is available from *Electronic Publishing & Printing*, 29 North Wacker Drive, Chicago IL 60606-2574.

2. A complete table of imagesetter vendors, models, and features can be found in Roth (1990).

3. Several companies manufacture compatible film and paper products, including DuPont, Anitec, and Kodak. Our tests indicated that Fuji's products are superior for overall density, dot structure, and consistency of emulsion.

4. This assessment follows from the editor's conversation with Mike Gladden of Waldman Graphics, Pennsauken, NJ, a major PostScript imaging service bureau. Gladden reported (in October 1989) that *Illustrator*, *FreeHand*, Aldus *PageMaker* and Quark *XPress* files accounted for "95 percent of the Lino output at Waldman."

5. As reported in Mattson (1989), Adobe's "workaround specifications" are as follows: Black 45° 120 lpi; Cyan 72° 133 lpi; Magenta 18° 133 lpi, Yellow 0° 127 lpi.

6. See "Adobe PostScript Level 2," *TypeWorld* 14:13, July 1990.

REFERENCES

Mattson, Mark (1989). Desktop mapping at Temple University. *Cartographic Perspectives* 3, Fall 1989; pp. 3-12.

Roth, Steven (1990). The imagesetter explosion. *Macworld*, February 1990; pp. 141-147.

ACKNOWLEDGEMENT

David DiBiase's contributions to this article, both editorial and substantive, are appreciated.

GIS REPORT AVAILABLE

SEAI's new three-volume 588-page report on *Geographic Information Systems: An Assessment of Technology, Applications, and Products* is designed as a strategic planning guide for organizations interested in the benefits of GIS implementation and companies seeking to exploit the market opportunities which GIS presents. The report focuses on the practical aspects of GIS: PC and workstation-based systems, assessment of commercial products, and implementation. Chapters 7, 8 and 9 include a description of over 300 GIS installations and products. Five GIS case studies are described in detail in chapter ten. An assessment of the commercial products and services of 126 companies is presented in chapter 13.

The report is available for \$485 from SEAI Technical Publications, Inc., P. O. Box 590, Madison, GA, (404) 342-9638, FAX: (404) 342-9642.

BASIC MAP READING I AND II: SLIDE/TAPE PROGRAMS

S.D. Johnson and A.C. Kellie, Virginia Polytechnic Institute and State University, Blacksburg, Department of Civil Engineering, November 1982, 23p, OSM-565. PB90-199613/WNR; price code PC A03/MF A01.

The Basic Map Reading program is a narrated visual treatment of skills necessary to use and understand topographic maps properly. The program emphasizes standard USGS 15' quadrangle maps, but the basic skills explained in the program are useful when using any topographic map. The program is divided into Parts I and II to make the segments short enough for comfortable viewing and listening without fatigue and to provide a natural break in the content of the material presented.

Part I deals with the quantitative aspects of a topographic map and the important features of a USGS 15' quadrangle map sheet. The program shows how distance, elevation, direction, area, and position are determined from a topographic map. Part II treats the qualitative aspects of a topographic map. Interpretation skills necessary to understand symbology and identify landforms using contour lines are covered in this segment.

Contact: National Technical Information Systems, 5285 Port Royal Road, Springfield, VA 22161.

NEW LANDSAT GROUND RECEIVING STATION PLANNED

The Turkish government has informed the Earth Observation Satellite Co. (EOSAT) that it plans to build a satellite ground station to receive and process Landsat remote sensing data. The station will be located near Ankara, Turkey, and is scheduled to be operational by the launch of Landsat 6 in late 1991.

The government-owned Post, Telegraph and Telephone (PTT) will oversee construction and operation of the Ankara station. Within the next month, the PTT anticipates soliciting bids for construction of the multi-million dollar station. Construction is expected to be completed in about one year.

The Ankara station will be the eighteenth ground station built to receive Landsat data. All seventeen existing Landsat ground stations have been built by the governments of the countries in which they are located. Station operators pay EOSAT an annual fee to receive Landsat data which may then be sold by the station.

New Landsat ground receiving stations have been coming on line since EOSAT acquired control of

the Landsat program in 1985. The two most recent additions were Quito, Ecuador, in November 1989, and Islamabad, Pakistan, in early 1989. Interest has also been expressed in building new stations in Kenya, Western China, New Zealand, Korea and Taiwan.

TIGER FILES FOR PCs

American Digital Cartography, Appleton, WI., has announced that it can now provide Topographically Integrated Geographic Encoding and Referencing System (TIGER) Line Files in formats that run on PCs and workstations. TIGER Line Files were produced by the U.S. Census Bureau in cooperation with the U.S. Geological Survey and contain information on streets and roads, railroads, water features, political boundaries and census geography. Users can display, modify, add features and plot digital TIGER maps using AutoCAD, Intergraph and most popular CAD and GIS packages. *GIS World*, 3:3, June/July 1990

TIGER-TO-DXF TRANSLATOR

Micro Map and CAD, Littleton, CO, has released a stand-alone translator that provides users of AutoCAD with access to the Census Bureau TIGER map files. TIGER-to-DXF Translator is a fully customizable translation utility that converts TIGER basic data and shape files into AutoCAD R110 compatible DXF files. TIGER map features may be translated with customizable parameters for linetype, color, polyline width and merging layer names. The TIGER-to-DXF TRANSLATOR comes with a simple TIGER attribute viewing program that allows TIGER record viewing as a pop-down menu choice.

Contact: Micro Map and CAD, P.O. Box 621135, Littleton, CO, 80162, (303) 973-2768.

NEW MARKET STUDY ON AUTOMATED MAPPING

Applied Data Corporation, a Boston area market research firm, has just completed a new survey of the latest technology for automated mapping and mapmaking. The survey identifies several mapmaking applications and end user mapping markets which offer significant growth opportunities for cartographic firms and their suppliers. The results of this survey are examined in detail in a new and comprehensive market study.

One of the most prominent and influential trends is the growth of desktop mapping. As desktop computers have gained power, cartographic databases have expanded in detail and variety. The software that integrates cartographic and demographic databases continues to become more powerful and easy to use.

The study contains market analysis, statistics, end user profiles, product descriptions and forecasts designed to provide readers with all of the information necessary to identify technology trends and growth opportunities for automated mapping and mapmaking. One hundred twenty five pages in length, it is available for immediate delivery from Applied Data Corporation, P.O. Box 834, Andover, MA 01810. The price is U. S. \$1,050; supplemental copies are priced at \$150 each.

fugitive cartographic literature

Interesting articles about cartographic information often appear in unexpected outlets. The goal of this section is to bring those publications to the attention of our readership. We invite synopses of papers appearing in journals other than those devoted to cartography, geography, and map librarianship.

Ziegler, A. M. (1990) Mapping the mesozoic and cenozoic at the University of Chicago. *Geotimes*, April 1990, pp. 23-24.

reviewed by Edward J. Hall, Kent State University

The Paleogeographic Atlas Project of the Department of Geophysics at the University of Chicago was founded in 1975. Its goal, among others, was to produce a large format, full color Mesozoic/Cenozoic paleogeographic atlas of the world. The project involves developing several computerized databases in order to produce the atlas and to assist in various projects tied to the atlas.

The first step in atlas preparation is to generate base maps. The continental shapes and interrelationships need to be researched and verified. The next step is to figure the rotational axis for each time period under consideration. The project must also establish the polar position for each map interval to within five degrees — a difficult level of accuracy to achieve. The project must also assemble statistically reliable paleomagnetic data for comparison with paleoclimatologically sensitive sediments and floral data without incurring circularity from using the data.

The team of researchers is charting the positions of shorelines and various bathymetric and topographic contours. Inferences on the pattern of shoreline motion can be made long after the direct record has been erased once it is known if a basin results from thrust loading or extension. Physiographic studies will be

made after the effects of glacial loading on the Canadian Shield, Greenland, and the Baltic Shield are determined, reversed and evaluated. Warping of the shield areas and the appearance of kilometer-high mountain ranges appeared to be common at that time.

An epeiric sea connection across Manitoba to Hudson's Bay and through the Hudson Strait to the Labrador Sea may explain the similarities of Cretaceous faunas from the Western Interior Basin (North America) to West Greenland.

Inferences may also be made about the Cretaceous marine rocks through combining a knowledge of sea level curves with biogeographic connections. The aim of the Paleogeographic Atlas Project is to complete the Mesozoic/Cenozoic North American maps by June 1990 and then the maps of Europe and northern Asia. The last major problem area in producing the base maps and the final atlas will be the completion of the plate-tectonic interpretations of the Alpine and central Tethyan zone.

The scope of this atlas is extremely ambitious. I look forward to seeing the published volume.

Monmonier, Mark (1987) Making maps. *Design [The Journal of the Society of Newspaper Design]* 26, pp. 14-17. A geographer's view of newspaper cartography. *Reviewed by Ellen White, Michigan State University*

"Daily newspapers are a significant source of geographic information for the American public." So saying, Mark Monmonier proceeds to discuss some of the common problems with news maps that hinder their communication of valuable geographic information — information much of the public will obtain from no other source. A