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Release of V5.30 TNT products March 1996



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Release of V5.30 TNT products

More Features Than Ever!

Microlimages is pleased to distribute **V5.30** of the **TNT** products and the 38th quarterly release of the Map and Image Processing System (**TNTmips**). **V5.20** completed all the extra work of taking the **TNT** products across all popular platforms. As a result, more new application features are being introduced via **V5.30** than in any other quarter in the 10 year history of Microlimages. It is also a pleasure to get back onto our routine schedule by getting **V5.30** out approximately on schedule.

Status of Client Base?

General comments

Microlimages is pleased to announce that more **TNTmips** and **TNTview** systems were shipped in January 1996 than in any previous month in the history of the company. Unfortunately, it was not possible to top this in the shorter month of February. A significant number of clients also switched from Windows 3.1 to Windows 95 by exchanging their software authorization keys. These clients have reported good results and increased speed and productivity using the **TNT** products via Windows 95.

Software Support

With the release of **TNTlite** products, it will now be necessary for you to identify your software license key number as well as yourself when contacting Microlimages for software support. This will ensure that our staff and communication lines are not busy with requests for **TNTlite** products support and that you continue to get the kind of free professional support you expect

Clients using the **TNT** professional products as well as others using the **TNTlite** products are encouraged to join the moderated **TNTtalk** listserv or forum. You can join **TNTtalk** by sending email to listserv@microimages.com. This email should be: sub tnt-talk Your Name. **TNTtalk** is provided by Microlimages to assist our clients in communicating with us and each other, requesting help, discussing applications of mutual interest, seeking staff, and so on. **TNTtalk** is not designed to replace Microlimages' direct software support for the **TNT** professional products. However, it can be of assistance to **TNTlite** users and as a means to access the experience of others in spatial data analysis.

Abbreviations

Microsoft is confusing our communications with the naming of its operating system products. As a result, it is getting difficult to be precise when referring to these products without using a long string of words each time they are referenced. This makes it hard to understand the precise meaning in the long sentences which reference them. For simplicity, the following abbreviations have been adopted in this **MEMO**.

W31 = Microsoft Windows **3.1** or **3.11**.

NT or **NT4** = Microsoft **NT 3.1**, **3.5**, or **4.0** (**3.1** is error prone and thus the **TNT** products require the use of **3.5** and its subsequent patches).

W95 = Microsoft Windows **95**.

Mac = Apple Macintosh using the 68xxx Motorola processor and **MacOS 6.x** or **7.x**.

PMac or Power Mac = Apple Macintosh using the 60x Motorola PowerPC processor and **MacOS 7.x**.

MI/X = Microlimages' **X** server for Mac and **PC** microcomputer platform and operating system.

Summary of New Features

The following is a brief summary of highlights of the new features and processes which are being released in **V5.30**.

- Conversion to and from 190 new geodetic datums has been added.

- A maintenance process is available for the recovery of objects from damaged project files.
- Measurement tools now report statistics for any raster object georeferenced to the current display. For example, draw a polygon over a color image on the screen, and select other rasters for a report of the area, perimeter, mean, etc. of the same polygon area.
- Zooming a display in and out is now sensitive to a scale range which can be set for each georeferenced object being displayed. For example, zooming into a low resolution satellite image or map can automatically switch to a higher resolution airphoto when both are selected and assigned appropriate scale ranges.
- The display of elements from **CAD** and vector objects can automatically be controlled by scale if the types of elements in these objects have a "scale to show" assigned. For example, a vector object containing **TIGER** data of a county may show only interstate highways and major rivers, ... when the whole county (e.g. full view) is selected. As the scale of the View window is zoomed into a specific area, the more detailed features are displayed, such as the city street pattern.
- A new data line at the bottom of the View window can optionally be exposed to show the scale of the current view, which can be numerically edited to change the scale of the current view. The same line also continuously reports the geographic coordinates of the cursor in the selected projection.
- An interactive interface has been added to the display process to allow [theme maps](#) to be quickly prepared for the point, line, and/or polygon elements in a vector, **CAD**, or **TIN** object. Legends can also be readily created for the theme map.
- Pairs of stereo images can now be viewed in stereo via anaglyph glasses and other new devices. After these stereo views are generated, they can be scrolled and zoomed in tandem while maintaining stereo fusion.
- The multiple element selection and tabular attribute viewing are now available in the display process, matching and extending those introduced in the object editor in **V5.30**.
- A graphical field can be exposed in a tabular attribute view. This field shows a color sample of the point, line, or fill pattern currently assigned to each exposed record. Selecting a single graphical field with the mouse by using it as a "push button" will expose the Style Editor window. Thus, these graphical fields and the styles of the elements they represent can be interactively edited, just like the numeric fields in the attribute records.
- Additional features have been added to the Style Editor window to assist in the creation and maintenance of your style objects.
- Approximately 200 new bit-map fill patterns are provided to represent geological materials.
- The raster editor has been rewritten, improved, and imbedded within the object editor. Now any of the principal spatial layers (raster, vector, **CAD**, and **TIN**) and their associated objects can be selected in a complex view and edited.
- A new and improved neural network-based color separation and interactive line following process have been added to the object editor.
- Land surveys can now be converted to **COGO** (COordinate GeOmetry) point lists and log files containing and describing control surveys with their associated plot elements. The plot elements (buildings, properties, etc.) are overlaid upon the current view as entered and can subsequently be saved as **CAD** or vector objects.
- **ESRI's** shapefiles can be imported. The internal and external formats of Atlas**GIS** data sets can be imported.
- A completely rewritten process is available to extract additional physiographic (explicitly watershed) characteristics from an elevation raster.
- The **DEM**/ortho process can automatically locate flat (e.g. lake) and inclined uniform terrain features which do not correlate well and interpolate their elevations from the boundary points. Further improvements in the process have increased the detail in the elevation raster.
- The scanning process has been completely rewritten and improved. It now supports the same previous scanners, plus those scanners and digital cameras supplied with a **TWAIN** driver.
- A broad suite of about 40 important new functions has been added to the [Spatial Manipulation Language \(SML\)](#). These include functions to select objects and their characteristics. Another group allows your script to display these selected objects. All spatial object types can be displayed in the normal **TNT** View window with its tool bar and with your added "next action buttons". A group of functions are now available to output a database table.
- A color snapshot print of the screen up to 1080 by 1024 pixels can now be made in all TNT products: **TNTmips**, **TNTview**, **TNTatlas**. This is a standard "**PO**" feature in every product

- available at no additional charge.
- Microsoft Windows printer drivers supplied by almost every new printer can now be used for the snapshot printing or for **TNTmips** optional printing via map layout.

What is Underway Now?

The following features for *possible release* in **V5.40** have been started. However, please do not take these as firm commitments but more as an indication that MicroImages is not running out of ideas or work.

Probably Available Now

The following minor features which did not make V5.30 should be completed by the time you read this **MEMO**. If they are of particular immediate value to you, please request them via software support.

- The export of the shapefile format.
- The final determination is underway on the feasibility of supporting old video capture boards such as the **TARGA** under **W95**. This technical issue will be resolved, one way or the other, by the time you receive this **MEMO**.
- MicroImages' standard printer drivers and Postscript printers will be supported for the Mac versions of the **TNT** products for screen snapshot and map layouts.
- A modified **X** server for use on **W95** and **NT** platforms will enable the **MI/X** server to start up a **TNTmips** installed on a remote, networked computer. This is already possible when the local device is an **X** terminal, a workstation, or a Mac using **MI/X**. It could already be done using an indirect and inconvenient procedure when the local machine was running Microsoft Windows.

Planned Features

- The **3D** display process is being completely rewritten and integrated into a consolidated display process. The result will probably then be referred to as the viewing or visualization process. The objective of this rewrite is to modernize the capability activity, increase its ease of use, incorporate new features, support stereo perspective viewing, prepare a framework for "fly-bys", and so on. Extension of stereo viewing to view stereo rendering of **3D CAD**, vector, and **TIN** objects will also be incorporated. Creating stereo views from single images and their associated **DEM** will also be added.
- A suite of indicator and selection tools will be created for use in stereo views. They will be incorporated first into the **DEM/ortho** process to allow the stereo aided selection of tie and control points, drawing of ridge and drainage lines (break lines), and so on. These tools are also headed for the stereo view process to support the selection of object features (lines, cells, ...) in a stereo view. Ultimately, they will provide the basis for a stereo object editor.
- The three modules in the **DEM/ortho** process will be revised to better integrate them and add these new stereo viewing and drawing features.
- A variety of new tools and raster analysis functions will be added. In general these will be minimum distance, buffer zones, "cost surfaces", and other kinds of tools for analyzing terrain features and their relationships to features in other line objects (e.g. roads, trails, drainage, highway interchanges, ...).
- A new and advanced vector analysis process will be written to complement the vector merge and vector extract processes. Together these three processes will provide an advanced replacement for the existing vector intersection process which will then be discarded.
- An **ODBC** interface between **TNTmips** and Microsoft Access will be undertaken.
- The current mosaic process will be refurbished, its interface modernized, and new features added.
- The interactive, interobject selection and analysis procedures did not make **V5.30** as planned and have been rescheduled. These are the means by which questions about multiple objects can be answered interactively. For example, draw a circle on the display of an image, and ask for an overlay or pin map of the water wells from a vector object not currently displayed.
- *New Platform*

- MicrolImages has now taken delivery on an **IBM PowerPC** based workstation and its **AIX V4.10** of **UNIX**.

MI/X (MicrolImages' X Server)

for Microsoft Windows Platforms

All **TNT** windows in **W31**, **NT**, and **W95** now also have **W95** style icons in their window bar for menu, minimize, maximize, and close operations.

The size of the main **X** window (**TNT** desktop) used by all **TNT** products within **W31**, **W95**, and **NT** can now be set to anything from 100 by 100 pixels up to the maximum size allowed by the display license of your professional product or to any size for the **TNTlite** products.

Setting this **TNT** desktop window to less than the maximum makes it easier to see and access windows of other software which may also be running concurrently with your **TNT** product. Also, it becomes easier to move between these products as all you need to do is place the mouse in any window and select. If your display has adequate resolution, this feature makes it possible to easily monitor and move readily between the operation of several programs running concurrently.

Most new Pentium machines have display boards with 2 megabytes of **RAM** and a 1280 by 1024 pixel, by 256 color, display mode. However, you may have purchased a **D40** = 1024 by 768 pixel **TNT** product. You can now set up Windows to use the higher resolution display mode and set up the **TNT** products, to confine it to the 1024 by 768 pixel area. This will allow the **TNT** product to run within your license limits; the **TNT** desktop window can be positioned anywhere, and other concurrent software's windows can be exposed as well. Of course the concept is even better if you can use a 1600 by 1200 display on a 20 inch or larger monitor. You still may want a **D50** or **D60** product to use the entire screen area in some **TNT** applications while setting up to use a smaller **TNT** desktop in other kinds of activities. To constrain any **TNT** product to use a smaller **TNT** desktop you will need to edit your **TNTMIPS.INI** file. For example, to constrain your operations to a 512 by 512 pixel window, add the following information to your **TNTMIPS.INI** file in the **[XSERVER]** subsection and restart the product.

```

...
NumRows=512
NumColumns=512
...

```

for MacOS platforms

As was announced in a previous MicrolImages **MEMO**, all color modes (256, thousands, and millions) are now supported by the single **MI/X** server for the Mac and for the PMac.

Windows 95

Clients using **W95** may wish to obtain and apply its first service pack. Unfortunately, this pack is only available for the English version of **W95**. International versions of this service pack are promised by Microsoft later this year. MicrolImages has installed this service pack and has yet found no significant improvements added by it which would enhance the performance of the **TNT** products under **W95**. The corrections it provides appear to be primarily related to the use of **W31** printer drivers from within **W95**.

Windows NT 3.51

Clients using **NT** should make sure that they have installed all 4 service packs to patch this operating system. The latest service pack (**SP4**) for **NT** (both Intel and Alpha) is available from the Microsoft **FTP**

site (<ftp.microsoft.com>) under /bussys/winnt/winnt-public/fixes. To ensure that everything has been properly updated, make sure you obtain both **SP3** and **SP4** for the platform you are running on, and follow the directions included at the **FTP** site.

Windows NT 4.00

Early in this quarter, MicroImages obtained a copy of the beta release of Microsoft Windows **NT 4.0**. **NT4** replaces the **W31** interface with the **W95** interface as well as adding many other new network related features. To date, in restricted testing, MicroImages has not detected any special problems in using the **MI/X** server, the gray software authorization key, or other **TNT** processes within **NT4** beta.

MacOS 7.5.3

Initial Tests

MicroImages has just installed this latest upgrade to the **MacOS**. First of all we cannot understand such a ridiculous numbering scheme--seems like Apple continues to be afraid to admit something is wrong, or correspondingly, that something is new, right, and important.

To date, in restricted testing, MicroImages has not detected any special problems in using the **MI/X** server, the **ADB** software authorization key, or other **TNT** processes within **MacOS 7.5.3**.

Unfortunately, **7.5.3** does not seem to solve any of the fundamental problems of the **OS** for the PMac. As Apple has promoted this release for native 32-bit file access and faster loading times, you would think that they would have built in the features provided by Speed Doubler. Alas, the addition of Speed Doubler to a 132 megahertz PMac system using **7.5.3** still doubles the loading speed of a **TNT** process. New memory management features were also not provided in this release, so **RAM** Doubler and OptiMem are still needed as well.

Since this new system has many, many defect patches, so far in limited use it seems to be more reliable in general and with **RAM** Doubler and Speed Doubler in particular.

MacOS Problems

IMPORTANT:

If you use **RAM** Doubler and Speed Doubler, use only the very latest versions with any **MacOS 7.5.x**. For **RAM** Doubler this would be **V1.6.1** and for Speed Doubler this would be **V1.1.2**. These upgrades can be obtained via Internet or directly from Connectix.

Numerous articles have recently appeared to document that Speed Doubler can damage files (data or systems). MicroImages has experienced this damage on several machines with serious consequences with **V1.1.2**. Remember that **SD** is a patch to the **MacOS**. It seems pretty clear that this **SD** error is actually the fault of the **MacOS**. Furthermore, if this new **MacOS 7.5.3** incorporated this simple improved cache feature, then we would not need **SD**.

RAM Doubler versions before **V1.6.1** seem to hack themselves and disappear, and again the actual problem seems to be with the **MacOS**. Again you conclude that if the new **MacOS 7.5.3** incorporated this simple memory compression feature, then we would not need **RAM** Doubler. If you have 32 mb of real **RAM** memory or more on your Mac or PMac, you may want to skip **RAM** Doubler.

It has been clearly documented that the **MacOS 7.5.2** released to support devices on the **PCI** bus will fail and do many bad things if a device is attached to **SCSI ID #5**. Apple claims to have resolved this error in **V7.5.3**, but recent experience at MicroImages may be to the contrary.

Additional details on these problems can be found in the column entitled **MACINTOUCH** in MacWEEK issues: 26 February 96 pages 49 and 50, 25 March 96 pages 40 and 41, 1 April 96 pages 54 and 55, as well as other issues. This column seems to be the best and current printed source of information on

problems with the **MacOS**.

Installation

for Mac and Power Mac

The "A" CD is now dual formatted. One portion (240 megabytes) of this CD is formatted HFS for direct reading on the Mac. It now contains:

- all the products including their TNTlite alternatives for the Mac and Power Mac,
- a standard Mac installation Icon/process which is faster since the files containing the TNT products are no longer compressed,
- the illustrations files,
- the documentation in Microsoft Word V6.0 files for the Mac,
- the Crow Butte sample data (some smaller versions of the familiar objects added for **TNTlite** use), and
- a second set of Project Files of sample data for the San Francisco Bay--Hayward Quad which have been sized down to fit the TNTlite limits.

The remainder of the "A" CD is formatted as **ISO 9660** and contains all the same materials outlined above for use with **W31**, **W95**, and **NT**.

The extra Mac formatted floppy is no longer needed since the improved Mac installation process can now be operated directly from the **CD**. The installation of the Mac product from **CD** is now just as fast as the Microsoft Windows versions. The following times were obtained on a Power Mac using a Power PC model 604 chip and a 4X **CD-ROM** drive: 3.5 minutes to install and set up **TNTmips** processes of about 100 megabytes; less than 1 minute to install a separate copy of **TNTview**; 30 seconds to install a separate copy of **TNTatlas**; 30 seconds to install the on-line manual; 4.5 minutes to install all illustrations; and 1.5 minutes to install the documentation files for use in Microsoft Word 6.0.

You will be unable to run the Mac version of **TNTmips** products directly from a **CD** as you can on Windows and **UNIX** platforms. This is the next installation/operational feature to add for the convenience of our Mac clients.

IMPORTANT:

Microlimages has been unable to find a means to make the universal or serial keys (red, blue, or green keys) work on all Mac and PMac serial ports. At the present time the only key which can be used to run the **TNT** Mac and PMac professional products is the special Mac **ABD** key.

Unfortunately this means that at present you cannot obtain any **TNT** products authorization key which can be moved between the Mac platforms and any other platforms. This problem results because the voltage levels on the pins in the Mac serial port are different from the **PC** or **UNIX** workstations, and in fact vary between types of Macs. Microlimages will continue to seek a solution to this problem.

for W31, W95, and NT

The most significant change is the installation of the **TNTlite** products. The choice to install the **TNTlite** products without a key, or the **TNT** professional products with a software authorization key is now presented in the first installation window. The new **TNTlite** products and their installation are explained in another Microlimages **MEMO** included with **V5.30**, dated 25 March 1996, and entitled "Announcing **TNTlite**".

One time-saving feature has been added to the installation of all the **TNT** products. After you have installed one product (e.g. **TNTmips**) you will not have to restart the installation process to install another (e.g. illustrations). After a successful installation of the selected product, you are returned to the same selection window to choose and install another.

for UNIX

The installation procedures for **UNIX** based workstations remain the same as in **V5.20**. These scripts used to install on **UNIX** workstations already follow the standard installation procedures on these platforms and continue to require only incremental changes to improve them.

Installed Sizes

Loading a full installation of TNTmips 5.3 only onto your hard drive (exclusive of any other products, data sets, illustrations, Word files, etc.) requires the following storage space in megabytes:

| | |
|---|-----|
| PC using W31 | 114 |
| PC using W95 | 114 |
| PC using NT (Intel) | 114 |
| DEC using NT (Alpha) | 117 |
| Mac using MacOS 7.1 (680xx) | 64 |
| Power Mac using MacOS 7.5 (PPC 60x) | 74 |
| Hewlett Packard workstation using HPUX | 95 |
| SGI workstation using IRIX | 120 |
| Sun workstation using Solaris 1.x | 86 |
| Sun workstation using Solaris 2.x | 79 |
| IBM RS/6000 using AIX 3.x | 152 |

V5.30 of the **TNT** products for the **DEC** Ultrix, **DEC** workstation using **OSF/1**, and the Data General Avilion platforms are available upon special request for which a special **CD** will be produced.

Upgrading

If you did not order an upgrade of your **TNT** professional product, and wish to do so now, please contact MicroImages by **FAX**, phone, or email to arrange to purchase your quarterly upgrade to **V5.30**. Upon receipt of your order and processing, MicroImages will supply you with an authorization code *by return FAX only*. Entering this code when running the installation process allows you to complete the installation and immediately start to use TNTmips 5.3 and the other TNT professional products. If you do not have an annual subscription to **TNTmips**, you can purchase **V5.30** under the elective upgrade plan at the cost in the tables below. Please remember that new features have been added to **TNTmips** each quarter. Thus, the more quarters you are behind **V5.30**, the higher your upgrade cost, up to a fixed limit. Upgrades from all previous versions of **MIPS** and **TNTmips 4.8** or earlier are the same, fixed cost shown below. As usual, there is no additional charge for the upgrade of your special peripheral support features, **TNTlink**, or **TNTsdk** which you may have added to your basic **TNTmips** system.

Within the NAFTA reselling area (Canada, U.S., and Mexico):

| TNTmips Product Code | Price upgrade from TNTmips: | | | | | |
|----------------------|-----------------------------|-------|-------|-------|--------------------|------|
| | V5.10 | V5.00 | V4.90 | V4.80 | V4.70 (or earlier) | |
| V5.20 | | | | | | |
| D30 to D60 (CDs) | \$250 | 450 | 600 | 700 | 750 | 750 |
| D80 | \$375 | 675 | 900 | 1050 | 1125 | 1125 |
| M50 | \$250 | 450 | 600 | 700 | 750 | 750 |
| U100 | \$450 | 800 | 1000 | 1200 | 1300 | NA |
| U200 | \$780 | 1400 | 1875 | 2200 | 2350 | NA |
| U300 | \$1030 | 1850 | 2475 | 2900 | 3100 | NA |

For all other nations:

| TNTmips Product Code | Price upgrade from TNTmips: | | | | | |
|----------------------|-----------------------------|-------|-------|-------|--------------------|------|
| | V5.10 | V5.00 | V4.90 | V4.80 | V4.70 (or earlier) | |
| V5.20 | | | | | | |
| D30 to D60 (CDs) | \$300 | 560 | 750 | 875 | 940 | 940 |
| D80 | \$425 | 800 | 1050 | 1225 | 1300 | 1300 |
| M50 | \$300 | 560 | 750 | 875 | 940 | 940 |
| U100 | \$500 | 850 | 1050 | 1250 | 1350 | NA |
| U200 | \$830 | 1450 | 1925 | 2250 | 2400 | NA |
| U300 | \$1080 | 1900 | 2525 | 2950 | 3150 | NA |

TNTview™ 5.3

As usual the new features available in **TNTview** mirror the new features described below for the **TNTmips** display processes (e.g. scale controls, theme mapping, improved element selection, graphical fields, ...).

Import and Hot Linking

Import and Hot Linking were promised for **V5.30** but did not make it simply due to lack of time. These

features are being added now, so if their use is important to you prior to **V5.40**, check their status via software support.

Color Printing

The same limited direct snapshot color printing capability is now available in all TNT professional products: **TNTmips**, **TNTview**, **TNTatlas**, and the **TNTlite** products. This capability is explained in more detail below in the section on new features in **TNTmips**. Also attached is a sample of a color print which can now be prepared by **TNTview**.

SML support

It has not been MicroImages' policy to create optionalized incomplete analysis software. However, **TNTview** is a visualization process. **CAD** sketching, theme mapping, color printing, import and linking (pending), and the power of **SML** are all migrating from **TNTmips** into **TNTview**. Rather than increase the price of **TNTview** to cover all these features, the use of **SML** will be an add-on \$1000 option. Thus, only those who want to conduct special analysis, and expand and extend the functions of **TNTview** will need to concern themselves with an extra cost. Special arrangements can be made to obtain this **SML** option for use in **TNTview** in **V5.30**. With **V5.40**, this feature can be added to an existing **TNTview** at any time by the purchase of the appropriate authorization code.

Upgrading

Within the NAFTA reselling area (Canada, U.S., and Mexico):

| TNTview Product | Price upgrade from TNTview: | | | | | |
|------------------|-----------------------------|-------|-------|-------|--------------------|-----|
| | V5.10 | V5.00 | V4.90 | V4.80 | V4.70 (or earlier) | |
| V5.20 | | | | | | |
| W31, W95, and NT | \$95 | 170 | 225 | 265 | 280 | 280 |
| Mac and PMac | \$95 | 170 | 225 | 265 | 280 | 280 |
| DEC/Alpha via NT | \$125 | 225 | 300 | 350 | 375 | 375 |
| Unix single user | \$155 | 280 | 375 | 440 | 470 | 470 |

For all other nations:

| TNTview Product | Price upgrade from TNTview: | | | | | |
|------------------|-----------------------------|-------|-------|-------|--------------------|-----|
| | V5.10 | V5.00 | V4.90 | V4.80 | V4.70 (or earlier) | |
| V5.20 | | | | | | |
| W31, W95, and NT | \$115 | 205 | 270 | 320 | 335 | 335 |
| Mac and PMac | \$115 | 205 | 270 | 320 | 335 | 335 |
| DEC/Alpha via NT | \$150 | 270 | 360 | 420 | 450 | 450 |

| | | | | | | |
|------------------|-------|-----|-----|-----|-----|-----|
| Unix single user | \$185 | 335 | 450 | 530 | 565 | 565 |
|------------------|-------|-----|-----|-----|-----|-----|

TNTatlas™ 5.3

Color Printing

The same limited direct snapshot color printing capability is now available in the TNT professional products (**TNTmips**, **TNTview**, **TNTatlas**) and the **TNTlite** products. This capability is explained in more detail below in the section on new features in **TNTmips**. Also attached is a sample of a color print which can now be prepared by **TNTatlas**.

Upgrading

Within the NAFTA reselling area (Canada, U.S., and Mexico):

| TNTatlas Product | Price upgrade from TNTatlas: | | | | | |
|-------------------------|------------------------------|-------|-------|-------|--------------------|-----|
| | V5.10 | V5.00 | V4.90 | V4.80 | V4.70 (or earlier) | |
| V5.20 | | | | | | |
| W31, W95, and NT | \$65 | 115 | 150 | 175 | 190 | 190 |
| Mac and PMac | \$65 | 115 | 150 | 175 | 190 | 190 |
| DEC/Alpha via NT | \$80 | 140 | 190 | 220 | 235 | 235 |
| Unix single user | \$95 | 170 | 225 | 265 | 280 | 280 |

For all other nations:

| TNTatlas Product | Price upgrade from TNTatlas: | | | | | |
|-------------------------|------------------------------|-------|-------|-------|--------------------|-----|
| | V5.10 | V5.00 | V4.90 | V4.80 | V4.70 (or earlier) | |
| V5.20 | | | | | | |
| W31, W95, and NT | \$80 | 135 | 180 | 210 | 230 | 230 |
| Mac and PMac | \$80 | 135 | 180 | 210 | 230 | 230 |
| DEC/Alpha via NT | \$95 | 170 | 225 | 265 | 280 | 280 |
| Unix single user | \$115 | 205 | 270 | 320 | 335 | 335 |

TNTatlasTM sampler of San Francisco

The dual formatted "A" CD for **V5.30** and an improved installation process has eliminated the need for a floppy diskette for installing the **TNT Mac** and PMac products. This progress in Mac installation procedures will make it possible to move ahead in this quarter to produce Prototype3 of this sample atlas to work on both Windows and Mac platforms.

On-Line Documentation

So many new features were produced this quarter that we have been unable to thoroughly document them all. The size of the documentation has expanded slightly this quarter to 2079 pages. A lot of new pages were added, but the extensive subsections in the Prepare volume on Edit Vector and Edit **CAD** were deleted along with the processes. The corresponding subsections on the object editor have not yet expanded to such a level of detail.

Last minute supplemental pages which do not, or only partially occur in the on-line documentation were created for new processes. These sections were completed for **V5.30** after the master **CDs** were created for the reproduction process. These additional pages are included in supplemental, printed form as follows.

Watershed

New **SML** Functions

Interactive Line-Following and Coordinate Geometry (**COGO**) Tools

Off-Line Documentation

Many clients may not yet be aware that the **TNT** on-line documentation is also made available in Microsoft Word files by chapter for both Mac and Windows platforms. The installation programs for all these versions now provide an option to copy these Word files to wherever you designate on your hard drive. The appropriate version of Microsoft Word will then let you view, browse, search, and use all its other features. All the illustrations are embedded directly into these Word files for rapid scrolling and viewing.

You do not need to own and use Microsoft Word as your normal word processor to use it with these **TNT** files. Microsoft now has freeware Word Viewer products for **W95**, **W31**, and the Macs. These viewers can be downloaded from <http://www.microsoft.com/MSWord/> or Microsoft Network from the Word Forum (MSWORD) or via CompuServe, Genie, and MSPN from the Microsoft Software Library. On Internet, the

Word Viewers are located on the Microsoft anonymous ftp server which you can reach as ftp ftp.microsoft.com.

New TNTmips Application Features

* Paragraphs or main sections preceded by this symbol "*" introduce significant new processes, or features in existing processes, which are released for the first time in **TNTmips 5.3**.

System

Search tree subobjects used to locate elements (e.g. for selection) in vector, CAD, and TIN objects are now saved, which prevents the need to regenerate them in memory. For large objects, this saves a considerable amount of the time and the space needed to continually regenerate them. They are now automatically recreated and saved in processes which create and alter these kinds of objects (e.g. import, edit, ...).

Icons

Thirty-three new, large icons have been added to the collection used in the TNT products. A color illustration of these new process-oriented icons is attached. Fifty-three new, small icons have been added and are noted on the attached color reference sheet.

Profile View

There is a new "stair step" viewing mode in addition to point-to-point plot passing through the data values. This new mode shows each data point in the profile as a horizontal line with a vertical riser up/down to the level of the next point.

** Datums*

Over 190 additional new Geodetic Datums have been defined. Datum conversions are now automatically performed when necessary for all available projection transformations. There are 186 datums defined using standard Molodensky Transformation parameters. In addition, 8 multiple regression solutions are provided for contiguous continental areas. The multiple regression method has a stated accuracy of +/- 2 meters over the defined areas when transforming to or from WGS84.

The equations for the many datums and their conversions can be found in a DMA Technical Report entitled *Department of Defense World Geodetic Systems 1984: Its definition and relationships with local geodetic systems*. (DMA TR 8350.2, Second Edition, 1 Sept 1991. DMA Stock No. **DMATR83502WGS84**). The cover page for this reference is attached providing further information should you wish to obtain it.

The following are the names of the 186 datums added to the list using their Molodensky Transformation parameters.

World Geodetic System 1984
 World Geodetic System 1972
 North American 1927
 North American 1983
 Adindan - Mean
 Adindan - Burkina Faso
 Adindan - Cameron
 Adindan - Ethiopia
 Adindan - Mali
 Adindan - Senegal
 Adindan - Sudan
 Adindan - Somalia
 Ain el Abd 1970 - Bahraib
 Ain el Abd 1970 - Saudi Arabia
 Anna 1 Astro 1965
 Antiqua Island Astro 1943
 Arc 1959 - Mean
 Arc 1950 - Botswana
 Arc 1950 - Burundi
 Arc 1950 - Lesotho

Arc 1950 - Malawi
Arc 1950 - Swaziland
Arc 1950 - Zaire
Arc 1950 - Zambia
Arc 1950 - Zimbabwe
Ascension Island 1958
Astro Beacon E 1945
Astro DOS 71/4
Astro Tern Island (FRIG) 1961
Astronomical Station 1952
Australian Geodetic 1966
Australian Geodetic 1966 - MRE
Australian Geodetic 1984
Australian Geodetic 1984 - MRE
Ayabelle Lighthouse
Bellevue (IGN)
Bermuda 1957
Bissau
Bogota Observatory
Bukit Rimpah
Camp Area Astro
Campo Inchauspe
Campo Inchauspe - MRE
Canto Astro 1966
Cape
Cape Canaveral
Carthage
Chatham Island Astro 1971
Chua Astro
Corrego Alegre
Corrego Alegre - MRE
Dabola
Djakarta (Batavia) DOS 1968
Easter Island 1967
European 1950 - Mean
European 1950 - MRE
European - Western Europe
European 1950 - Middle East
European 1950 - Cyprus
European 1950 - Egypt
European 1950 - UK/Ireland
European 1950 - Finland/Norway
European 1950 - Greece
European 1950 - Iran
European 1950 - Sardinia
European 1950 - Sicily
European 1950 - Malta
European 1950 - Portugal/Spain
European 1979
Fort Thomas 1955
Gan 1970
Geodetic Datum 1949

Graciosa Base SW 1948
Guam 1963
Gunung Segara
GUX 1 Astro
Herat North
Hjorsey 1955
Hong Kong 1963
Hu-Tzu-Shan
Indian
Indian 1954
Indian 1975
Ireland 1965
ISTS 061 Astro 1968
ISTS 073 Astro 1969
Johnson Island 1961
Kandawala
Kerguelen Island 1949
Kertau 1948
Kusaie Astro 1951
L.C. 5 Astro 1961
Leigon
Liberia 1964
Luzon
Mahe 1971
Massawa
Merchich
Midway Astro 1961
Minna - Cameron
Minna - Nigeria
Montserrat Island Astro 1958
M'Poraloko
Nahrwan - Oman
Nahrwan - Saudi Arabia
Nahrwan - UAE
Naparima BWI
North American 1927 - Caribbean
North American 1927 - Central America
North American 1927 - Canada
North American 1927 - Canada (MRE)
North American 1927 - Alaska
North American 1927 - Continental USA
North American 1927 - Bahamas
North American 1927 - Cont. USA (MRE)
North American 1927 - San Salvador
North American 1927 - Eastern USA
North American 1927 - Yukon
North American 1927 - Western USA
North American 1927 - Canal Zone
North American 1927 - Alberta/BC
North American 1927 - Cuba
North American 1927 - Manitoba/ON
North American 1927 - Greenland
North American 1927 - Eastern Canada
North American 1927 - Mexico
North American 1927 - NWT/SK
Old Egyptian 1907
Observatorio Meteorologico 1939
Old Hawaiian - Mean

Old Hawaiian - Hawaii
Old Hawaiian - Kauai
Old Hawaiian - Maui

Old Hawaiian - Oahu
Oman
Ordnance Survey of Great Britain 1936 - Mean
Ordnance Survey of Great Britain 1936 - England
Ordnance Survey of Great Britain 1936 - England/Wales
Ordnance Survey of Great Britain 1936 - Scotland
Ordnance Survey of Great Britain 1936 - Wales
Pico de las Nieves
Pitcairn Astro 1967
Point 58
Pointe Noire 1948
Porto Santo 1936
Puerto Rico
Provisional South American 1956 - Mean
Provisional South American 1956 - Bolivia
Provisional South American 1956 - Chile (Northern)
Provisional South American 1956 - Chile (Southern)
Provisional South American 1956 - Colombia
Provisional South American 1956 - Ecuador
Provisional South American 1956 - Guyana
Provisional South American 1956 - Peru
Provisional South American 1956 - Venezuela
Provisional South Chilean 1963
Quartar National
Oornoq
Reunion
Rome 1940
Santo (DOS) 1965
Sao Braz
Sapper Hill 1943
Schwarzeck
Selvagem Grande
Soviet Geodetic System 1985
South American 1969 - Mean
South American 1969 - MRE
South American 1969 - Argentina
South American 1969 - Bolivia
South American 1969 - Brazil
South American 1969 - Chile
South American 1969 - Columbia
South American 1969 - Ecuador
South American 1969 - Baltra
South American 1969 - Guyana
South American 1969 - Paraguay
South American 1969 - Peru
South American 1969 - Venezuela
South American 1969 - Trinidad & Tobago
South Asia
Tanararive Observatory 1925
Timbalai 1948
Tokyo - Mean
Tokyo - Japan
Tokyo - Korea
Tokyo - Okinawa
Tristan Astro 1968

Viti Levu 1916
 Wake-Eniwetok 1960
 Wake Island Astro 1952
 Yacare
 Zanderij

When selecting a geodetic datum, information regarding the area for which the datum is used is provided for reference. The parameters provided by the **DMA** report for each Molodensky Transformation are also shown. Additional datums can now be added if the proper transformation parameters are provided. Only a few parameters are needed for Molodensky Transformation. Full specifications for new datums require more complicated equations which you will need to acquire from your national geodetic or mapping agency, armed forces, or data provider. You will find some of these special local or national client-supplied datum definitions have already been added to the on-line list for **V5.30**.

Project File Maintenance

Histograms

The information for raster histograms now shows cell value, count, and total area for each cell value.

** Recovering Project Files*

How do they get damaged? An object in a Project File can be damaged in a variety of ways, and this may make the entire Project File unusable. Probably the most frequently reported source of damage to a specific object is from some form of power glitch which occurs when an object is being written into a Project File. This may be a split second interruption which is not even noticeable, or a complete disruption of the power. While this object is corrupted, it is unlikely that any other objects in that Project File are damaged.

Bad sectors and other deterioration can also suddenly develop on a hard drive or may show up *only intermittently*. Some other software or even the operating system can also damage a Project File. These and related kinds of after-the-fact damages are very likely to show up in a **TNT** Project File first, as they often occupy most of your hard drive's capacity.

Finally, an error in a **TNT** process may damage a Project File, but this is much less likely to occur than the above conditions. It is very hard to damage any file by reading it! However, an operation which writes a damaged or incorrect new object into an existing Project File might create a problem in accessing the other valid objects in that Project File.

What can now be done about it? At the request of several clients in countries with unstable power sources and clients using portable computers, a new "Recover Project File" option now occurs on the menu. It provides you a new process designed to recover objects from a damaged Project File. It simply allows each valid object in a damaged Project File to be accessed, checked, reassembled, and moved into a new Project File. A report on the status of each object examined, recovered, and moved, or not, is also generated. Damaged objects which cannot be read and reassembled are left behind so that the new Project File contains all the recovered objects and all their subobjects.

Please note that the new Project File created in this fashion is compacted and releases the space of the damaged objects and all other free space that results from previously erased objects.

In the future, additional effort will be put into making this recovery process more and more intelligent so that it may be able to automatically patch or recover at least part or all the data from the corrupted object (s). These capabilities will be developed and added as you send in damaged Project Files or objects for MicroImages to analyze and determine the kinds of tests and corrections which are needed.

*** Measurement Tools**

A subtle, but widely used feature of old **DOS MIPS** is now available in **TNTmips** with expanded capabilities. It is now possible to view raster statistics for an area selected via the various measurement tools. The rasters to be "measured" do not even need to be showing in the View window! For example, simply draw a polygon on the view, which may be showing a 256 color-infrared reference image

(especially if you only have an 8-bit color display board). Then select other coincident raster objects such as the three 8-bit rasters used to create it, and review the statistics for each of the raster objects for the same area as the polygon.

DOS MIPS was primarily a raster based product, and this approach was used to visualize properties of images. For example, you were viewing an 8-bit color compressed natural color **TM** image and wanted to review the mean and variance of the same polygonal area for all 7 **LANDSAT TM** bands from which the image being viewed was created.

Within **TNTmips** with its much wider management of spatial data types, the same kinds of measurement tools provide a much more expanded horizon for their applications. For example, you may be viewing a vector or **CAD** display of a vegetation or soil map and want to draw a line (not necessarily straight) and review a profile of the cell values in rasters of other biological factors generated from Kriging **GPS** collected field samples. Or you may want to carefully examine the histograms of a polygon area for a series of multispectral, multitemporal, or multisensor raster objects which do not even have the same cell size, map project, or extents.

Display

General

The relative zoom and current map scale are now displayed in a reference line at the bottom of each view window. Both the map scale and zoom factor fields can be selected with the mouse and edited so that accurate numeric values can be entered to directly control the redraw operation. Cursor map coordinates also now appear in this same new reference line. By default these coordinates are displayed in whatever projection each group is viewed in. The coordinate system and their units may be selected using the Options menu in the View window.

Point, Line, and Polygon style selection has been made much easier. The user interface is now more graphical, and patterns may now be easily selected from the "standard" set of patterns provided in `stdstyle.rvc`.

It is now possible to override vector or **CAD** label heights when drawing.

A warning message will now be displayed if a tool is selected that is not usable in the current context. For example, if the route tool is chosen when no vector layers are available.

A status message dialog will now be displayed while raster histograms are being computed. Previously the process appeared to be "hung" if the raster was very large.

Raw Data viewing for vector, **CAD**, and **TIN** objects is integrated into the Element Selection window.

** Tabular Views*

The advanced multi-element selection tools are now available in display for use with the Tabular View window. These were introduced last quarter in the object editor and have been expanded and enhanced. Multiple element selection can now be used on the active vector, **CAD**, or **TIN** layer. Elements of all the types which occur in these layers can be selected and their attributes viewed and edited. Element selection can be sequential; by area selection tools such as polygons, circles, squares, ...; and other new methods.

All attribute or database tables for a View can now be listed and managed in the same selection window. For example, when you select a database, the window simply opens up, or expands, to show the tables.

Full support of database editing is available in the Tabular View window.

Multiple elements can now be selected in the active layer in the View window by selecting the corresponding attribute record(s) in the Tabular View window. For example, you can choose to view all

available records in the Tabular View window. Then select several records in this window and choose the Select Elements option on the Record menu in the Tabular View window. All the elements in the layer being viewed tied to these records will then be selected.

** Element Selection*

A new Element Selection dialog box is now used in display. A color print entitled "**Element Selection and Attribute Assignment**" is attached to illustrate this significantly altered and more interactive approach. It has not yet been implemented in other processes such as the object editor, but will be during the next quarter.

The new button "Selection Parameters" in this dialog box drops down a panel exposing small labeled icons for each group in the active view. Using the mouse to select a group will expand the list to show small named icons for all layers in that group.

Selecting a layer will expand the list to show an array of small icons pertinent to that type of layer (e.g. raster, vector, ...). These icons provide direct access to important selection controls for each element type in the layer. Each row of icons in the array for a layer is for a particular element type (e.g. for a vector layer, rows for points, lines, and polygons will be shown). All icons in a row look like a tool bar and will be gray if the object did not have, or you did not choose to view, any of that type of elements in the current layer (e.g. the icons for line elements will all be gray if only points and polygons were displayed).

The row of small icons for a raster layer can be toggled to:

- show the attribute tables list,
- show the list of internal attribute tables,
- make a new table,

The rows of small icons for a vector layer for points, lines, or polygons can be toggled to by type to:

- select an element type for attribute viewing,
- show the attribute tables list,
- show the list of internal attribute tables,
- make a new table,
- select all elements,
- clear all elements selected, and
- invert the selection of elements.

The row of small icons for a **CAD** layer lets you:

- show the attribute tables list,
- show the list of internal attribute tables,
- make a new table,
- select all elements,
- clear all elements selected, and
- invert the selection of elements.

The rows of small icons for a **TIN** layer provide all the same options as available for vector layers, except the rows are for nodes, lines, and triangles.

The Show Attribute Tables and Show Internal Attribute Tables icons insert a list of the names and descriptions of all tables available for the element type selected directly into this dialog box. A small icon also appears at the beginning of each row in the list of tables and can be used to open up the Tabular Attribute window for that table.

A toggle button lets you expose or hide active element information for vector, **CAD**, and **TIN** objects directly in the Element Selection window (formerly obtained in a separate window using Examine/Raw Data).

All these new interface features are best understood by experimenting directly with them and selecting everything with the mouse.

** Scale Controlled Views*

Layers may now be selected to draw only within a specified range of map scales. This allows construction of a layout containing data at various levels of detail and extent. As you zoom in on the data, the layers that have greater detail can appear and the layers that have the coarser detail can disappear. This technique can be used to build an "atlas" where you simply zoom in to where you want to look through a series of progressively more detailed objects.

Display and other processes that use displays now provide scale controlled views of vector, **CAD**, and **TIN** objects. Your monitor, and thus all view windows, will need to be calibrated to a known scale. Support/Setup/Preferences provides a means of entering the current width and height of your display screen.

This view by scale feature now provides a virtual pyramiding effect in the display of vector, **CAD**, and **TIN** layers with a decrease in display time. For example, if you currently display 100% of the elements in a full view of a vector object of a **TIGER** data set for a county, this individual layer might take a minute to display on a fast **PC** or **PMac**. However, with this scale option, a full view of this object can be designed to show only major roads, rivers, and political boundaries. Thus only 5% of the total vector elements might be read and displayed for this full view.

A properly designed scale controlled view also looks better than displaying 100% of the elements, which yields mere blobs of color at full view. As you zoom in, more kinds of elements would be "turned on" but the area viewed and the elements which need to be read are correspondingly reduced. Vector, **CAD**, and **TIN** objects are already optimized to support efficient, direct access to a subportion of their elements (by using index tables, buffering, caching, etc.). Thus you can anticipate further improvements in viewing vector, **CAD**, and **TIN** layers by scale where the amount of the object being read and rendered at any scale is consistently reduced by your scale design to be less than 10% of the total object.

The key to display by scale is using georeferenced line objects (available for years) and then getting a scale assigned to the element types they contain. Some of the ways in which you will be able to assign scales to element types are as follows.

- 1) You will be able to use display to view all the elements in the object and interactively set or edit the scale for each class. For example, in display, select an element class or multiple element classes, enter a display scale--the scale field for these element types is added or altered--then redisplay to see if the results are as desired at that scale.
- 2) Open a tabular attribute window for all element types, and manually enter a "scale to show at" value for each element class attribute value.

** Improved Selection of Elements*

In **V5.20** the element location index table that contained the pointers to the disk locations of all elements that make up the vector, **CAD**, or **TIN** object were recomputed when the process started a selection procedure. For example, when you used display to retrieve the attributes of a single polygon, you saw a status bar. This bar was timing the computation of this index table which was retained in memory to locate the element(s) you select.

It is not necessary to recompute this pointer table in a process which does not actually alter the object. For example, displaying the attributes of selected elements within a display activity does not alter the index table. Thus, **V5.30** now stores the index table in the Project File as an associated subobject for each vector, **CAD**, and **TIN** object.

This system level modification is transparent to you and is analogous to the handling of the histogram subobject for rasters. The histogram subobject of a raster object is computed or recomputed and saved when a raster object is created or altered (e.g. import, edit, etc.). The histogram subobject is then automatically read and used by subsequent processes (e.g. display). Processes which alter a raster object (copy, edit, etc.) automatically recompute and store the new histogram subobject.

The new element location index table subobject functions similarly. It is computed or recomputed and stored when the object is created or altered (import, edit, copy part, validate, etc.). It is no longer

necessary for processes or subprocesses which use, but do not alter, objects to compute this index table as it will be read from the subobject. Therefore, you will no longer be seeing the associated "Building Search List" status bar and the time it takes away from you. Similarly, processes which alter objects, such as the object editor, can use this stored subobject for their initial display and then recompute and replace what has actually been altered as part of saving an altered object. The net result is processes that support selection of elements from vector, **CAD**, and **TIN** objects will be considerably faster to start up. The most obvious benefit will be when display is used to select elements and expose their attributes.

How will you get these new subobjects for your existing line objects? They will automatically be computed and stored the first time you use the object within a **V5.30** process. Of course, this will not work with objects stored in project files on **CDs**. This read-only media will be detected, and the attempt to store an index table subobject will be aborted. Thus each time an object is used from an earlier **CD**, the index table will be recomputed as in **V5.20**. Objects created for **CDs** made after **V5.30** will automatically contain their associated index table subobject which will not need to be changed since the associated object cannot be altered on this media.

** Theme Displays (a prototype process)*

The term "desktop mapping" has recently gained popularity in conjunction with rising public interest in a class of products initially designed for isopleth or theme mapping. In the United States this has been one manifestation of the general public's interest prompted by the wide availability of the Census Bureau's County **TIGER**, **USGS's DLG**, **DMA's** Digital Chart of the World, and other public domain spatial data. As a result, a variety of general public commercial software has been created to assist in the use of this readily available spatial data in business geographics, gerrymandering, demographics, and related applications. This software has gradually expanded into other **GIS** applications directly and by extension via other companion or wrap-around products. The widening popularity of this class of lower cost (\$300 to \$1000) products has in turn provided the basis for a market for improved and additional proprietary data sets on **CD** and other media.

Complex theme mapping has previously been provided by **TNTmips** and **TNTview** by using a query to control which vector or **CAD** elements are displayed and in what styles. Queries give you extensive powerful control over what is to be selected and how it is to be rendered. However, creating simple theme maps such as polygons filled with colors denoting population density takes too much time and requires experience with creating logical queries. As a result, an interactive theme mapping approach has been introduced into **TNTmips** and **TNTview**. A sample color theme map entitled "**Population Theme Map for California Counties**" is attached. On the reverse of this print is a list of the steps needed to create it within **TNTmips** or **TNTview**.

Theme mapping is simply another method by which vector, **CAD**, or **TIN** layers can be displayed and styled. Advanced MicroImages clients can approach theme mapping as a speedy aid to selecting and overlaying vector and **CAD** objects without writing a query. Beginners, especially those using **TNTview**, can use theme mapping on a single vector object to get those first maps produced fast without resorting to learning the database query language.

The new theme mapping feature in the **TNT** products is totally interactive. You may apply the theme mapping approach to points, lines, and polygons separately or in combination. It may not be obvious at this point, but this theme mapping applied to point data is a direct and easy route to producing a pin map. However, try it first on polygons by selecting your sample monochrome **SPOT** image for Crow Butte (CB_SPOT.RVC) then select the soil map overlay from the same Crow Butte data (CB_SOILS.RVC) and theme map the attribute values for the Potential Wheat Yield for each soil type as color transparent overlays for the image.

To use the theme mapping feature after you select the vector or **TIN** layer to display, choose the element type (points, lines, polygons, labels, ...) you wish to display, and use the style button to select style "By Theme". To design a new theme (since you have not created any) select the adjacent button "Specify ..." which opens the Theme Mapping Controls window. This window is where you design one or more theme map layouts for the selected layer. Choose the attribute to be mapped, the type of distribution, and the number and range of the values to be mapped. Then close this window and proceed on to display the layer as your theme map with default symbolism.

The Theme Mapping Control window provides a wide variety of additional optional features to use in the design of what your theme map will represent and how it will appear. The number of classes in the

theme map can be spread over any range of the attribute by equal area, equal count, or user-defined distributions. Ranges are shown and can be manually edited. A histogram of attribute distribution can be opened with vertical bars showing the current class boundaries. The mouse can be used to drag these bars to reposition any and all classes.

The default colors and symbolism of each class can be interactively created or selected from your style objects. A style object controlling the symbolism of each theme map can be created. Point color and symbolism; line color, style, and width; or polygon solid or transparent colors, color spread, and bit-map fill can all be selected for each class or assigned from any available style object. The appropriate point, line, or polygon style object editor can be directly accessed to select, edit, or create a completely new style. Intermediate classes can be set to be skipped (i.e. not rendered) such as a range of polygons which are 100% transparent to the underlying layers. The amount of transparency for solid color of each polygon class can be specified to allow partial exposure of an underlying image.

When you have completed the design of what your theme map will contain and how it will appear, you save the design as the default or named layout for that layer.

Theme mapping applied to points in a vector object is a fast way to create pin maps from the points in a vector object. You can easily set style, exclude ranges, set ranges, etc.

Legends

You can add legends to your theme maps. To do this, you create a normal point, line, or polygon legend (Layer/Add/Legend). When it asks for a style object to use, pick the style object that is stored under the theme table, which is a subobject of the vector object. The descriptions will be generated automatically, but they can be changed.

Stereoscopic Viewing (a work in progress)

The display process now provides for easy viewing of stereo images which have a tie point subobject established by Step 1 in the **DEM**/ortho process. First use Step 1 to prepare and save a few colocated tie points to interrelate the geometry of the pair of stereo images. It is not necessary to complete Step 1 and generate two new raster objects with correct epipolar geometry. Thus, only a few tie points need to be entered if you are not planning to complete the epipolar solution. The display process uses these few tie points to automatically resample one image's geometry sufficiently to reorient and rescale it to fuse its view in stereo with its mate.

If you plan a lot of stereo viewing of the image pair, then go ahead and complete Step 1 and produce a corrected pair of images, as their subsequent use in display requires only a simple geographic locking. Thus moving around in stereo view mode will be faster since the images will not have to be resampled every time you choose to change your stereo view position.

During the next quarter, adding stereo measurement and related features to display and other processes will be undertaken. As part of this activity, establishing the tie point and epipolar geometry of a stereo pair will be incorporated into the display process.

Once stereo fusion and relief exaggeration is established in **V5.30**, then zoom, pan, scroll, and other relocation operations automatically maintain the stereo fusion. The area of stereo overlap of the left and right images is also automatically determined and limits the stereo viewing area for all these display changes within the stereo mode. If you wish to experiment with stereo viewing, please remember that the sample **TNTatlas** of San Francisco contains a stereo pair of 10 meter panchromatic **SPOT** images and three stereo pairs of color-infrared **NHAP** airphotos for this purpose.

Anaglyph stereo displays for two-color lens glasses can now be automatically made from panchromatic stereo images (or corresponding bands for the **NHAP** images on the **CD**). Considering the simplicity of this viewing device, it provides quite usable stereo but cannot present color. The very simple cardboard glasses with two color lenses (one red and one blue or green) require a two color blended image which is automatically displayed. You can specify a variety of colors for each lens, so simply cut out a cardboard set of glasses and tape appropriate color foils over each eye opening. A pair of cardboard anaglyph glasses will be distributed with **V5.40** of the **TNT** products which will contain expanded features for their use while viewing stereo images.

MicroImages has finally located a low cost color stereo viewing device and supported it. It has been built for the game industry by a Korean firm and is called 3DMAX. It is based upon an **LCD** shuttered lens and a video sync card which must go into the bus, costs \$200, and provides good color stereo for displays up to 1280 by 1024 pixels. Currently these glasses are restricted to the Microsoft Windows-based **PC** platforms, but the Mac versions are promised in the next couple of months.

Microlimages has supported these glasses in **V5.30** and imported 30 sets directly from Korea for internal development use with very few left over for those clients who wish to experiment this quarter. With **V5.40's** expanded use of stereo, detailed information on these glasses will be provided. It is likely that these particular glasses will be sold directly by Microlimages for a while, as it is unlikely that you will be able to readily acquire them in most nations.

Microlimages has a developer's set of CrystalEyes **LCD** shuttered glasses and the related video sync device. Support for this \$700 color stereo viewing device will be added after V5.30 ships. Please note that these glasses will work with **PCs**, Macs, and workstations and do not require that any hardware be added inside your computer.

** Multi-element Selection in Display*

V5.10 and **V5.20** provided multi-element selection tools in the **TNT** object editor with the associated ability to open and edit multi-record or multi-line Tabular View window(s) for vector, **CAD**, and **TIN** layers. **V5.20** supported the use of Tabular View windows in display, but the element selection tool only allowed you to select elements one at a time. Now the multi-element selection tools are available in the display process. Circle, polygon, all, or other multi-element selection operations will show or hide the associated attribute records in the Tabular View window.

*** Graphical 'Fields'**

An innovative concept has been introduced into the **TNT** products where the Tabular View windows can now show a "graphical" field. The graphical field displays a color sample of the point, line, or polygon style currently assigned in the style table for each record exposed in the new Tabular View window. Thus, when both the display view and a Tabular View window are open, the graphical field provides an immediate legend to visually relate the symbolic display of the selected elements to their attributes (identities, descriptions, areas, ...). Graphical fields are shown in the attached color print entitled "Element Selection and Attribute Assignment."

The graphical field will be optionally exposed in the table whenever requested. It can be positioned as a vertical column or new field wherever you designate vertically among the existing numeric and text fields. Usually, it would be positioned as the first field in the Tabular View window as an interactive legend showing the style assigned to each record. Selecting any graphical field with the mouse will allow you to modify the style associated with that record without going to the Style Assignment window under the appropriate control panel. The graphical fields contents will also change when other tools and processes are used to alter the associated style table.

*** Styles**

Style Management

The unique new display of graphical fields now provides direct access to the style editor. Also more and more use is being made of **TNT** standard style collections (objects); your local custom developed collection(s); and potential contributed collections. These kinds of changes require continued gradual modification to the style assignment, design, and management tools in the **TNT** products. Styles, like fonts, require a sophisticated means of creating, managing, accessing, and keeping those assigned readily available for each principal object and layout. However, unlike fonts, extensive standard schemes are not in place within the operating systems and associated software.

Style management has to evolve in the **TNT** products in concert with the addition of new features (e.g. **TNT** object editor, graphical attribute fields, theme mapping, ...), issue large collections of standard symbol objects (e.g. the new geological fill patterns), respond to the need for new and advanced symbolism (e.g. complex combinations of symbols--point symbols inserted in line patterns), and so on. The following new features are available to assist in the use of styles.

Style Assignment Editor

A new direct access to the style assignment editor has been incorporated to support the concept of a graphical field outlined above. It allows the mouse selection of any graphical field from the Tabular View

window using the graphical field as a "push button". When "pushed" the color graphical cell will be changed to gray, just like a "pushed" icon button. This action will also expose the styles available in the current style object for that element type (e.g. point symbols) in the currently selected style object. Selecting a new style will substitute it for the one previously used, and the contents of the graphical field will be changed in the Tabular View window. When the view is redrawn, the new style will be substituted into the style table and used in the redraw of the layer. This new approach provides a *much easier, direct, and interactive means* of assigning or changing styles.

Style Object Editor

In previous versions of **TNTmips**, there were only a few style objects available to deal with, but now they are proliferating. Several new standard style objects have been added this quarter (see below). As a result, improvements are being gradually added to the style object editor. It is also possible to edit several style objects to accumulate a new style object to define the appearance of a specific layout or printed map. The style object you wish to edit can be switched without exiting the editor. You can also switch between style types (point symbols, line patterns, and fill patterns) within the editor. The unused styles or styles currently assigned to individual elements can be deleted from a particular style object. The new standard **TNT** bit-mapped fill patterns described below can now be selected and their individual styles assigned, copied, edited, and so on.

Standard Style Objects

Three standard style objects are now available to provide you with 215 geologic bit-map fill patterns. Four pages (1 color and 3 in monochrome) are attached to illustrate the contents of these new sets of patterns.

GMT Contributed Geological Fill Patterns

The one pattern set illustrated in color was contributed by MicrolImages' Representative for Papua New Guinea (**PNG**), Geo Mapping Technologies (**GMT**), located in Brisbane, Australia. These represent a collection of patterns that they wish to share with you which they have developed and find useful for the preparation of geologic maps with **TNTmips** for their clients in Australia and **PNG**. Should you have a collection of symbols or patterns you wish to share with other clients as a contributed library, please provide them to MicrolImages.

USGS Geologic Fill Patterns

The other two new sets are patterns developed by the United States Geological Survey (**USGS**) which have been very carefully rendered within the **TNT** bit-map pattern editor for your use. The source material for the preparation of these patterns is a *DRAFT* Open File Report 95-525 entitled *Cartographic and Digital Standard for Geological Map Information* issued in 1995 from the United States Department of Interior's United States Geological Survey (**USGS**) in cooperation with the Federal Geographic Data Committee. This thick *DRAFT* report contains hundreds of pages of reference materials describing and illustrating the standard symbolic representation to be used on geologic maps. It contains extensive point and related composite symbols used to render geologic maps as well as extensive descriptions for fill patterns and their complex coloring. Reference information on this important report is attached. Unfortunately, it is already out-of-print and will be superseded this summer with the printing of the final, official version.

The USGS symbol fill patterns are printed and attached in black and white to show the fine details of the symbolic patterns they contain. One set contains sedimentary patterns, and the other is for igneous and metamorphic materials. Their correct use requires that the internal symbolism contained in each of these patterns is rendered in a uniform color of varying intensity, while their background is in another uniform color of varying intensity. While the color combinations prescribed are harmonious, both the internal pattern of the symbol and the background color convey separate information about the geologic material represented by each geologic polygon.

Over 8000 different color fill pattern/background color combinations are specified in the **USGS** document. At this time, to use these **TNT** fill patterns in color, it will be necessary for you to select and separately specify the colors of the internal symbols and the background. It will be difficult to do this to

approximate the official colors until you can gain access to the completed **USGS** final report later this year. However, these patterns should still be useful to those applying **TNTmips** in geology. What is needed now is your assistance in locating reference material from which MicroImages can continue to construct suitable libraries of bit-map or fill patterns for other disciplines.

Standard Point Symbols

A large collection of 540 standard TNT point symbols were noted as available on special request in the MicroImages MEMO shipped with V5.20. This point symbol file is now included in V5.30.

Any Others in the Future?

Please, please, will any client who knows of similar map symbol reference materials for the United States of America and all other nations bring it to MicroImages' attention. As a software manufacturer, MicroImages does not have ready access to such information and materials, especially for other nations. This material might be in the form of similar national standards, reference charts, commercial symbol products and files for use in CAD, and so on. Some materials on the official Australian geologic symbols and Russian general map symbolism are already on hand. It is particularly important to identify reference symbol sets related to topographic, ecological, forest and other vegetation, and so on. During the next quarter, MicroImages will encode the few standard line symbols contained in the references we already have as well as additional points and patterns.

Object Editor

The object editor continues to improve and expand with incorporation of new, major processes for raster layer editing, **COGO** creation and editing of a **CAD** or vector layer, and the introduction of advanced interactive color line following to assist in the creation of, or adding to a vector or **CAD** object from a raster object. As previously announced, the older, independent Edit **CAD** and Edit Vector processes are no longer available for **W31** and **UNIX**. This releases about 7 megabytes of your hard drive space. Each of the new major processes is introduced in detail below. Enhancements and extended features added to existing processes were also added as follows.

The editor now automatically creates, updates, and maintains the standard attribute tables for **CAD** and vector layers (area, length, etc.) which you create or edit.

A new "Exclusive" selection mode is now available to place the elements selected into the list of selected elements. It also removes from the list of selected elements those elements that do not fit the selection criteria. For example, selecting lines with the circle selection tool will place the lines inside the circle into the selection list. At the same time, any previously selected lines not inside the circle are removed from the selection list.

Snapping of line ends in either line creation or the line snapping option in editing vector layers now has a "Snap back" angle tolerance which can be set. This prevents any extension of the line which would create an angle with the original line larger than the tolerance. This forces the line to snap forward, since an extension of the end of the line backward (such as from the end of a spur) would create a large angle with the direction of the original line. This tolerance can be set to prevent many undesirable snaps such as those from the end of a non-perpendicular spur which creates an undesirable small triangle between the spur, the snapback line, and the original line.

** Interactive Line Following (a prototype process)*

A new and completely rewritten color interactive line following subprocess is available in the **TNT** object editor. It provides rapid, semi-automatic heads-up digitizing with many improvements over the method available in the old **DOS MIPS** product. This process can reduce the number of colors in the input color map or drawing using neural network color compression (automatic unsupervised image classification). You then interactively determine from a small color palette which remaining color or similar colors make up the line type to trace, such as the tan colors of the contours (known in image processing as the labeling process). A color print entitled "Interactive Line-Following" is attached to show the user interface. Consulting it periodically will help clarify the following introductory comments. A printed supplemental documentation section entitled "Interactive Line-Following and Coordinate Geometry (**COGO**) Tools" is also enclosed.

As in other areas of the **TNT** object editor, this tracing process allows you to work on the layer or layers you select from your composite view. For example, you might be viewing a composite of **CAD**, vector, and raster layers, but tracing will be confined to the raster layer(s) you select. If you have a big map to digitize, and do not need these other object areas for reference, then hide or do not select them. Use of interactive line following on a large map may move the view many times, and rendering any extraneous layers takes time.

Tracing on **RGB** color images (3 objects of 8-bits each) requires that you select these multiple component layers from your composite view. The neural network color compression process then reduces the 16 million colors to 2, 4, 9, 16, 25, 36, 49, 64, or 256 colors. It can also be used to preprocess the 3 of 8 bit images to any of the color compressed images directly used in this tracing process, or for use elsewhere within **TNTmips**. The first step is to generate a color compressed raster object of 256 or less colors from which the colors of a particular type of line can be chosen and traced.

Several types of raster layers (objects) can be selected from a composite view to trace without any further color compression. These are 1-bit (binary), 4-bit (16 color), and 8-bit (256 color) rasters with color maps. These raster objects have already been color compressed or created elsewhere in a limited number of colors. For example, a different procedure has long been used to reduce 3 **RGB** images to be viewed on an 8-bit color display or saved. The neural network based color compression process is not applied to these 3 types of raster objects. Their color palette simply allows you to interactively choose or tune to the colors from their reduced set which make up the desired class of lines you wish to trace (e.g. all tan and associated colors of the contour lines). This can be thought of as yielding a binary raster with cells denoted as containing only the currently sought lines.

Once the colors of the specific class of lines have been selected, tracing can begin. A small 4X pixel magnifier area is exposed and continually updated showing the immediate area around the point in the view selected with the mouse. When the "Show As Binary" button is selected, only pixels of the colors currently selected to define a line type are shown in the magnifier area. They provide a simplified local view of exactly what would be traced. A new trace (e.g. new contour) can be started by selecting a point on the line in the view or on a fat pixel within this magnifier window. The trace will begin in one direction when you push the "Run" button and continue until a "point-of-confusion" (**POC**) or the length you set is reached. This can be called a trace segment. To trace in the other direction at any time in the future, simply select a cell in either window adjacent to the previous start cell, and a trace segment will be initiated in that direction.

How far a single trace segment will proceed can be controlled by selecting to trace through only a limited number of raster cells. The default is 1000. If this limited trace segment ends up somewhere off your view, then the view will automatically be repositioned. This might cause the current view to jump from one side of a big map to another. You can also specify that the trace segment will always terminate at the edge of the current view. This allows you to inspect the overplotted color line trace and confirm that you want to keep it all.

The actual line which has been traced will immediately be drawn in a color on the view. Traced lines can be very "point dense" or can be thinned as you choose. You select the amount of point thinning or weeding to be applied. The line which is drawn in the view and which will be saved has been thinned. It thus represents your choice of the approximation of the original "drawn" line which you wish to save.

All pixels that make up that drawn line in the current color set and used in tracing it will now also appear in the selected trace color in the magnifier window wherever you move it, even when you move on to trace different color lines. A "used cell" binary raster is created for this purpose to keep track of what lines have been traced and which original color raster cells have been "used up" by the current traces. While you do not directly use this raster, it will prevent you from picking any of these "red" cells to start the trace of a similar or other line type. No new trace will use any of these "used" raster cells. However, the line trace can jump over, connect with, circumvent, and otherwise deal with encounters with "used cells".

When a trace segment goes astray, you can back up to its start point by selecting the "Step Back" button. You can also choose a back up mode where this button backs up a specified number of cells. You set this number of cells and repetitively use the "Step Back" button to back up this amount. In either

case you can start forward using the "Run" button, or use one of the simple methods to navigate through the **POC**. Also remember that you are in the **TNT** object editor, so complex intertwining line situations can be resolved elsewhere with any of the **CAD** and vector line edit tools. For example, a cliff is encountered where several contours actually touch each other. The trace will probably see this as a **POC** and stop at it. Back up a few pixels each time this position is encountered, save the segment, and then restart on the line on the other side. When you are finished, use the line edit tools to construct connections for these contour lines which best represent the cliff.

You can apply morphology or shape filters to the lines being traced to better define them. You will see the immediate effect of the filter selected on the cells in the binary zoom window. Currently you can select from 4 different shape filters. *Plain Dilation* and *Winner Dilation* will fill in gaps and ragged edges and create a more uniform and easily traced "tube-like" representation from ragged lines. *Erosion* will remove spur cells that jut out along the edge of a line. *Median* will have results that will vary widely depending upon the nature of the lines.

Gaps occur in dashed lines or simply where lines or features of another color (roads over contours) took precedence in the printing of the map. You can control the size of the gap to jump. Setting this too large will allow the trace segment to jump to an adjacent contour when a "number gap" is encountered. Setting it too small will cause the trace segment to stop at every road which crosses the contours.

A set of trace control modes can be toggled on and off to assist you in how your trace segment proceeds along a line which may define a closed shape, intersection, etc. (e.g. crossing roads of the same type, around buildings, independent contours only, etc.). These modes can be set by the option menu to control such trace concepts as: proceed mostly forward; only with left turns; only with right turns; only left, right, up, down, and/or 45 degree diagonals; and others. A simple use would be to trace around a building which is defined but is in contact with others. Start the trace, then elect only right turns (or left as appropriate) to proceed automatically around that closed polygon area no matter what touches it. Similarly, a lot of soil or forest polygons can be traced in this fashion as topology is automatically created, and retracing common lines is prevented. When a trace segment is accepted, it is immediately added to the vector or **CAD** object being created. If this is a vector object, then the topological alterations created by this segment are resolved at that time. Attribute values can be attached to these polygons elsewhere with other tools in the **TNT** object editor. Reducing a map to vector or **CAD** form still takes a big investment in time. So back up the objects you create as you go along including the binary status raster object. This new interactive line following will allow you to save and resume your work, progressing onward from session to session.

* *Raster Object Editing (a prototype process)*

The capabilities of the raster object editor have been rewritten and integrated as a layer editor in the **TNT** object editor. This process has long been called the giant paint process. However, it differs in the respect that it does not contain all the advanced features of an artistic paint or photo retouch program. It is designed to let you manually, quantitatively and qualitatively, create and edit huge rasters of a wide range of data types.

The object editor introduced over the past year now supports the selection and editing of most types of spatial data object or layer: raster, vector, **CAD**, and **TIN** objects. The older, independent version of Edit Raster is also being provided this quarter and will then be retired. This will provide time for getting acquainted with the new version and for any required improvements.

All the familiar features provided by its predecessor are available in the raster layer or object editor. During the rewrite the following additional new features were incorporated.

Any data type (integer, real, complex, ...) which can be used as a raster object in the **TNT** Project File, from 1 to 128 bits per pixel, can now be created and/or edited.

Zooming, an icon tool bar, and other standard **TNT** display control features are now available.

All tools can now be operated over the entire extent of the raster object by scrolling around and are no longer restricted to the visible area. For example, a polygon can be drawn over the entire area of a raster layer which is larger than the current view by scrolling while using the drawing tool. Similarly, flood fills can now check and fill in the entire area of the raster's extent.

"Smart fill" now provides for a full preview of what will be filled before you authorize it to change any data.

Drawing line width can be selected with a slider as well as by numeric methods.

An eye-dropper tool has been added for color selection from within the view of the raster layer. The

border fill and smart fill edge colors are now selected with this eye-dropper tool.

The grid forming tool now has sliders to interactively allow the selection of the number of grid cell divisions. The grid tool also allows the grid line style (e.g. a dashed or color line grid) and thickness to be selected from a line style object.

An **X-Y** digitizer tablet can be used to draw circles, lines, polygons, etc. directly into cells in the raster layer.

* **COGO (a prototype process)**

Concepts

A new subprocess has been added to the object editor to create or edit vector and **CAD** objects with land survey, **GPS**, and other precision data. The **COGO** (COordinate GeOmetry) approach has been used by surveying and civil engineers for 30 years. It is also the precision grandparent of the children's **LOGO** language used on the earlier, simpler computers in schools. It permits the creation of precise control and descriptive data entries into new or existing objects tied to the ground surface, projection, and datum. **COGO** points and the objects they define, can be determined in **3D** space within the interior of something (e.g. a building, mine, timber stand, water, ...) and used to define an interior surface (in a vector object) and solid objects (in a **CAD** object).

Using this procedure for a land survey requires the entry of traverses of control points (**CPs**), lines, angles, distances, etc. which may or may not become part of your final **CAD** or vector object. However, from this control information you can design and compute the accurate positions of your **COGO** derived points, lines, and polygons which will become elements in the **CAD** or vector object. For example, you run a traverse of existing control markers, enter the traverse in this feature to produce **CPs**, and then use the **COGO** tools of Offset, Inverse, Resection, Intersection, etc. to design the precise corners and edges of the property boundaries or building lots (e.g. polygons) which are to be added to the **CAD** or vector object as elements.

Similarly, you might measure a set of precision **CPs** of existing physical features (e.g. wooden stakes, metal survey markers, concrete monuments, road intersections, etc.) with a differential **GPS** device. These **CPs** are used to tie your project to accurate, real world coordinates. From them you make a series of additional **COGO** measurements and projects to define the locations of points (e.g. rocks, trees, ...), lines (e.g. mine shafts, underwater locations, building interiors, ...), and/or boundaries of polygons (e.g. within timber stands). Many of these measurements are inconvenient by **GPS** or cannot be made at all. However, they can be made by other precise, or less precise means, with transits, distance measuring devices, tapes, and so on. The **GPS** data can be entered as **CPs** and the other secondary surveys used to define data points using the **COGO** tools to generate **COGO** elements (e.g. **CAD** or vector elements) for insertion into the object being edited.

General Operation

This **COGO** subsection can be accessed by a **COGO** icon on the Vector Tools or **CAD** Tools window. It exposes the new COordinate GeOmetry (**COGO**) window. This window provides a simple spreadsheet area for all the **CP** and **COGO** derived points you enter, edit, or compute. The coordinate list portion of the window can be hidden or exposed using the Edit Points icon on this window's tool bar.

CPs with known coordinates which are entered into the list with the identification numbers from 1 to 100 are taken as **CPs** only. They will never be projected into your view and the layer being edited. They also cannot be computed by any **COGO** action or tool. They represent any collection of **CPs** whose coordinates were computed or collected elsewhere from some other land survey, **GPS**, or other means. Computed **COGO** points will be automatically, sequentially numbered beginning at #101 and, depending upon your choice, they *may or may not be* projected into your current view and layer. If the "Add Result" button is depressed, the results of each successive use of **COGO** tool will be plotted into the view and layer. If the "Add Result" button is not depressed, then it is assumed that the **COGO** actions you take and the points computed are new **CPs** which are not plotted into the view. The coordinates of these new, internally computed **CPs** will also be added to the sequentially numbered list with an identification number greater than 100, using the next available number.

The tool bar presents 10 icons to select the survey or **COGO** geometry tool you wish to apply to generate new **CPs** or the **COGO** elements you want to project into the current view or layer. These

represent classical survey and geometry functions: Instrument Setup, Traverse, Inverse, Side Shot, Curve Traverse, Intersection, Resection, Best Fit, Station Offset, and Three Points on a Curve. An expanded definition of these tools is provided below. Detailed information is also provided in a supplemental documentation section entitled "Interactive Line-Following and Coordinate Geometry (**COGO**) Tools".

When you select a tool, it presents its dialog area where the identification of the points involved, angles, distances, and other properties can be entered. An "Apply" button then executes this tool using the parameters you have entered. Every tool you use also creates a descriptive script entry in a scrolling log list at the bottom of the window. As noted above, any new points computed by a tool will automatically be added to the point list using sequential numbers above #100 where it can be viewed at any time.

Sample Use

Example 1--creating CPs. A series of control points can be established from your traverse data. Assume that these actions are designed to repeat the original, recorded field survey steps.

First select the Instrument Setup icon to establish your instrument over any **CP** (e.g. #1) defined in the coordinate list. Then fill out the data for this starting point of your traverse, such as backsight **CP** or **COGO** point, and instrument height. The Instrument Point might be a bench mark point, a section corner, an accurate **GPS** point on a ship, an existing **CP**, etc.

Next choose the Traverse icon which will default to the previous point, in this case the Instrument Setup **CP** (e.g. #1). Enter the data collected at that **CP** (e.g. #1) to describe how to "traverse" to the next **CP** (e.g. #101). These measurements would be the azimuth of the forward sight and its vertical angle, the height of the target sighted, and the measured interior distance (from #1 to #101). When you "Apply", you create the new **CP** in your list (e.g. #101).

You can then proceed on to traverse forward step by step creating a sequence of **CPs** for your future use. However, to this point you have not added or projected anything into your view and the associated **CAD** or vector layer. You have merely established **CPs** to use to layout and design your **COGO** derived elements such as the actual property boundaries.

Example 2--creating a property boundary. Next you wish to enter the survey data which defines one edge of a property. Assume that these actions are designed to repeat the original, recorded field survey actions.

First select the Traverse icon and identify that the observations being entered (distance, angles, ...) were collected at a **CP** (e.g. #103) and will be used to create **COGO** point #150. This is a point you wish to insert into your current **CAD** object in the View window which is already showing a subdivision design imported from a **DXF** file. "Apply" will create **COGO** point #104 in your points list. The point will be inserted into the View window and **CAD** layer if you have the "Add Results" button depressed.

Now select the Traverse icon again and repeat the process using any **CP** (e.g. #103 again) to obtain the other end of the property boundary which will become a **COGO** point (e.g. #151).

Finally, select the Inverse icon to create a line between the points by entering the identity of **COGO** points which make up the ends of the line (e.g. #150 and #151). "Apply" will now draw the line into your **CAD** layer. Proceed to define all of the lines making up the property boundary polygon.

The style of the **COGO** point, line, polygon fill, etc. inserted into your current layer will be that which is currently selected for drawing that kind of element in the object editor. You can open and close the COordinate GeOmetry (**COGO**) window to get at the style tools while preserving your **COGO** position and activity. Alternatively, simply put in all the points, lines, etc. in a fixed color and then style, attribute, and modify them later in the main editor when all your **COGO** operations are finished. Remember that you are in the object editor, so any **COGO** derived element can be immediately edited with any other tool once this **COGO** window is closed.

Geometry Tools

Instrument Setup tool provides an entry form for selecting the point number of the current instrument position, a backsight point, instrument height, and the elevation of the instrument above the ground. It starts a new traverse or inverse, and sets the traverse or inverse area and perimeter to zero.

Traverse tool designates a sequence of traverse points that will be computed and added to the **COGO** dataset and current traverse chain. It provides for entering the identification of the forward sight to the

new point and the identification of the backsight reference point for angles. You also enter the distance to, horizontal and vertical angles to, and height of the forward target. When "Apply" is pushed, the target point will be computed, added to the point list, and the traverse area and perimeter updated and displayed in the Log window. The new point also defaults to become the current instrument position.

Inverse tool accepts the identification of only two points and computes the measured distance and azimuth between them. When "Apply" is pushed, the measurement will be displayed in the log area of the window. The traverse area and perimeter will be updated, and the second inverse point will become the new instrument or first point position. This allows the quick entry of a consecutive set of points to create a continuous line or polygon.

Sideshot tool creates a new **COGO** or **CP** from the current Instrument Point. The identification of the new **COGO** point is entered together with the distance to, horizontal and vertical angles to, and height of the forward target. The current instrument setup (position) will not be updated. Using sideshots to create new **COGO** points has no effect on any area or perimeter of the current traverse.

Curve Traverse tool is not yet available.

Intersection tool will create a new **COGO** or **CP** point at the intersection of two lines specified by identifying two starting points and entering the corresponding bearing angles or azimuths of the two lines defined for the starting points.

Resection tool creates a new **COGO** or **CP** point specified by the interior angles between three existing points. Inputs are the identification of the 1st, 2nd, and 3rd points and the interior angles between sightings from the new point to the 1st and 2nd and the 2nd and 3rd points.

Station Offset tool creates a new **COGO** or **CP** point by identifying a point (a station) along, or offset perpendicularly from, a baseline. Identify the starting point and enter the bearing or azimuth of the baseline, the distance along the baseline, and the perpendicular offset distance if any. Negative offset distance creates a point on the left side of the baseline.

Best Fit tool is not yet available.

Three Point Curve tool creates a new **COGO** or **CP** point as a radius point from three existing points along an arc. Alternate options are provided to insert an arc or a circle into your layer. Simply identify the 3 points and choose the action from the 3 options provided.

Future Plans

The **COGO** editing feature *has not been added to TNTmips* to support the entry of complex land surveys from scratch. This is best accomplished by using one of the several excellent stand-alone or **CAD** extension tools available exclusively for this purpose. These all create **DXF** files which can be imported into **TNTmips**. This new feature *has been added* so that a limited set of precision survey data can be directly entered for immediate use in the other **TNT** analysis processes. How much more additional software engineering effort is expended in this direction depends in large part on *how many* clients find this feature useful. However, some new features are planned for this subprocess which include the following.

- 1) The **CP** and **COGO** points and numbers will be shown on the view in "temporary" colors for easy reference.
- 2) **CP** and **COGO** points need to be selected by mouse from the view (all other points ignored if COordinate GeOmetry (**COGO**) window is exposed).
- 3) Better means to import existing lists of points as **CP** and/or **COGO** points.
- 4) Improved methods to restart a **COGO** session at a later date.

The following is the standard bible and extensive reference for **COGO**. It is not expensive at \$30, but may be of limited use in connection with the current **TNTmips** implementation.

The **COGO** Book--Fundamentals, Conventions, & Standards of COORDINATE GEOMETRY for Civil Engineers and Surveyors. by C.L. Miller and Sum Lin. 1990. 338 pages. Published by **COGO**, Box 378, Springfield Center, NY 13468, **FAX** (315)858-0893.

TIN Editing

The length, slope, and azimuth of the edges of the triangles now occur in the standard attribute table.

Database Editing

* You can now insert a new record and fill in its fields in a Tabular View window by picking "New" off the Record menu.

Tabular View Layouts

The units and the corresponding values in your numeric fields can be changed via the "Field/Format ..." menu.

Validate Vector Topology

Vector topology is automatically checked in various processes which create or modify vector objects (e.g. object editor) and the separate validate process. When two vector objects are merged or otherwise combined, they may contain a few or many common line elements (e.g. the same roads). These elements are meant to represent the same feature, but they actually end up slightly different through separate data preparation activities (e.g. digitized from an old map and from a new map). Conflation is the process of reconciling what is to be kept and what is to be replaced when some elements occur which are common and nearly the same, but not identical. The ability to handle conflation is a growing need in those **GIS** projects and systems maturing from the creation and use of virgin datasets into the use of current and frequently updated datasets where some redundancy is bound to occur.

One effect of merging of vector objects which contain overlap and redundancy is the creation of sliver polygons. A sliver angle in a **TNT** vector object is defined as an angle between two separate line segments protruding from the same node that is less than 0.00001 radians. The vertex on the shorter of the two line segments must also be within a tolerance distance from the other segment in order to remove the sliver angle. In **V5.20** sliver angles caused an error in constructing polygons when the validate function determining the angles of the lines protruding from a node erroneously selected the wrong line to follow. **TNTmips 5.3** vector object validation now removes the sliver angles between pairs of lines.

The validate function now checks line left/right polygon and start/end node attachments to make sure they are correctly defined.

TINs

A **TIN** object can now be converted to a vector object.

Standard Attributes

* The standard attribute table now includes the coordinates of a point which is located somewhere within the polygon and not within any island. This point can be used by other software as a seed point, for some **SML** objective, and so on.

A "compactness" ratio ($2 \cdot \sqrt{\text{area}} / \text{Perimeter}$), also available in the special fuzzy properties table, is now computed and stored in the standard attribute table of a vector or **CAD** object.

Raster to CAD Boundary Conversion

The process now creates a cell value attribute table for CAD polygons. In addition, any other attributes attached to the raster by cell value will be transferred and attached to the CAD polygons created.

Import/Export

* *Shapefile*

This format can now be imported. Its export will be available shortly after the shipment of **V5.30**.

TIGER

The latest 1994 extended **TIGER** format of the Census Bureau can now be imported. This import also continues to handle the original 1990 and the 1992 extended formats. It has also been modified to handle multi-file imports.

* *AtlasGIS*

Atlas**GIS**'s internal (*.**AGF**) and external (*.**BNA**) formats can now be imported. The capability for their hot link and export will be available shortly after the shipment of **V5.30**. These all are designed to allow easy sharing of data sets between **TNTmips** and Atlas**GIS**. Their address geocoding files (*.**GHP**) for states and provinces cannot be imported or exported as this format was not provided to MicroImages. This information also does not appear to be of particular use to users of **TNTmips** who will create or edit custom data for use in Atlas**GIS**. These files contain information that is specifically tied to the line files provided by **SMI** for direct use in Atlas**GIS**.

* *Import by Batch and SML*

Importing of raster, vector, and **CAD** datasets may now be performed with no user interaction by specifying command-line parameters. A series of import command lines can be set up in a file (e.g. a batch file) and directly executed whenever convenient.

Another method is to use the RUN command within an **SML** script to perform one or more imports to setup and perform operations on external data sets. For example, a script could ask for the name of an external **TIFF** file and **DXF** file, import them, and display the raster object and overlay the **CAD** object using the new display oriented **SML** functions introduced below. You could then perform the normal interactive display oriented processes (zoom, measure, **CAD** sketching, ...) and the script could also present a series of buttons to define further actions based upon your inspection of the composite display. These kinds of **SML** scripts could then be put on a tool bar(s) to provide direct access to your custom "canned" processes.

* *Export by Batch and SML*

It is now possible to perform raster export with no user interaction using command-line parameters. At present all rasters in the specified file will be exported to a single output file. If this operation is not allowed due to incompatibility between the size and/or number of rasters and the destination format, the export operation will not be performed. As an option, georeference information can be exported in either Arc/Info "world" or **TNTmips** "descriptive text". A typical use would be to RUN this command near the end of an **SML** script to export modified rasters to **TIFF** files. Eventually command line export of other object types will be provided for similar batch and **SML** applications.

Principal Components

This process may now be run with no user interaction by specifying input and output files on the command line. This could be used in an **SML** script performing a repetitive production operation. The specific parameters are described in the documentation.

Filters

The dialog for interactively testing a filter now uses the tool icons.

Trend Removal

This process now automatically pyramids the output raster object.

* Watershed Modeling (a prototype process)

Modeling of the physiographic properties of watersheds is one of the **TNTmips** interpretive processes available for raster objects that contain elevation data (**DEMs**, **DTMs**, etc.). This process originated in **DOS MIPS** and then migrated with little change into **TNTmips. V5.30** contains a completely new and rewritten watershed modeling process. You can find it at (*Interpret/Raster/Elevation/Watershed ...*). The new process has the same general objectives as the former process but uses new computer and mathematical logic to obtain the improved results.

The raster and vector objects created by this process and reviewed below contain physiographic characteristics of the input elevation raster. The creation of each of these output objects is optional. Additional physiographic properties can be computed from elevation rasters elsewhere within **TNTmips** (e.g. slope, aspect, elevation, ...).

An obvious direct use of these kinds of properties are as input to a variety of watershed hydrologic models to predict unit hydrographs, areas flooded, and so on. Other, less obvious uses might be as one set of inputs for modeling the spread of a liquid or gaseous chemical spill, where it has flowed, where it has accumulated in depressions with greater soil profile or groundwater contamination, where and how much has intersected a stream, and so on. Assessing cold air drainage patterns to plan orchards, vineyards, and other planting and subsequent protection of agricultural crops is another example application.

MicroImages plans to add additional raster spatial analysis and modeling processes and features into **TNTmips** in the next and future quarters. As in this revised process, the integrated use of **CAD**, vector, and **TIN** objects has, and will, stimulate many new and serendipitous results for analyzing raster objects of terrain and images.

Raster Objects Created

Extrema Points. The cell values in this new raster are the extrema (maximum and minimum) and flat areas in the input elevation raster. It is an 8-bit unsigned integer with a color map encoded as follows:

| | |
|-----------------|--|
| 0 = black | edges of the input raster, |
| 1 = gray | no extrema, |
| 2 = bright red | local single point maxima, |
| 3 = bright blue | local single point minima, |
| 4 = yellow | flat areas, |
| 5 = dark red | contiguous local maxima; "outflow" boundary points along the edges of a flat area, and |
| 6 = dark blue | contiguous local minima; "inflow" boundary points along the edges of a flat area. |

Flow Direction. Cells in this 16-bit signed, integer raster object contain the direction to the next lower cell for the eight ordinal and diagonal neighboring cells. If the eight neighbors are all higher then this value is zero. A negative cell value indicates multiple flow directions. The following defines all the values possible for the cells in this raster.

| |
|--|
| 0 = no direction (single local minimum only) |
| 1 = 45 degrees (top right diagonal) |
| 2 = 90 degrees (right) |
| 4 = 135 degrees (bottom right diagonal) |
| 8 = 180 degrees (bottom) |
| 16 = 225 degrees (bottom left diagonal) |
| 32 = 270 degrees (left) |
| 64 = 315 degrees (top left diagonal) |
| 128 = 360 degrees (top) |
| -1, -2, -4, ..., -255 = multiple directions |

Flow Accumulation. Each cell in this 32-bit signed, integer raster object contains the count of the cells which are all uphill from it. In other words, it is the number of cells whose flow would have to pass through (i.e. drain into) that cell.

Watershed Polygons. The cells in this 32-bit signed, integer raster object contain the unique identification number of watersheds they belong to. These numbers begin at 1 for the first watershed formed and increase by 1 until all watersheds are found and numbered. The boundaries between clusters of identical cell values thus define the boundary of the watershed. A watershed is defined as a hydrological drainage region which is the entire area above a selected point (called the "seed" point) that drains into that point.

Depressionless DEM. The cells in this 16-bit signed, integer raster object are z-values. The depressionless **DEM** is the original elevation raster object with all the depressions filled.

Vector Object Created

Watershed Polygons. This simple vector object contains the **XY** polygons which bound the watersheds defined by the watershed polygons raster object. Polygons are identified with the same number as the raster cells which made up their interiors, but the elevations (Z-values) of the boundary areas are also added from the input elevation raster. This vector object contains no point data.

The geometric properties of each watershed are also computed and stored in an internal attribute table with one record attached to each polygon. They may be optionally output to a text file. These parameters include watershed area; perimeter; and depression status, volume, and area.

Elevation Data Quality

The interpretation of the output raster and vector objects created by this process must be conditioned by the quality, data type, and extent of the input raster elevation raster.

Type. Input of an 8-bit elevation raster will produce poorer quality and less accurate results than a 16-bit elevation raster.

Artifacts. It is possible that your elevation raster object has artifacts, noise, and biases in it. Sometimes these flaws are not obvious when you display a 16-bit elevation raster in 256 gray levels. Elevation rasters created by modern surface fitting, analytical and soft photogrammetry, and other means often contain directional biases. These biases may become much more obvious when an additional sensitive surface analysis process, such as this watershed analysis, uses the flawed elevation raster as input.

A very widespread bias toward horizontal displacements can be found in many old **USGS DEMs**. This horizontal elevation shear resulted from the application of an early computational method of digitizing and surface fitting using regularly spaced north/south profiles used by **USGS**. Some extreme examples of this bias occur in some of the 7.5' **DEM** raster objects provided on Prototype2 of the sample San Francisco Atlas. The same kinds of horizontal and vertical biases also occur in the 7.5' sample Crow Butte **DEM** but are less obvious unless you enhance a display of a subrange of its elevation values from the 16-bit raster object. These **DEM**s will produce watershed boundaries which are dominated by north/south and also east/west line segments. This directional bias is very easy to see when you subsequently display your watershed polygons vector object.

Extents. Watershed modeling is also sensitive to how you define "the edge of your world"! If your elevation raster is arbitrarily, locally, and rectangularly bounded, then it will contain incomplete watersheds. Small elevation raster extents relative to the **X-Y** scale of the physiography and sizes of the watersheds such as single 7.5' **USGS DEMs** produce many incompletely defined watersheds around their edges. Any watershed in the elevation raster which intersects an arbitrary elevation data edge or limit will produce incorrect results, such as its area.

Using an elevation raster object which completely contains a large watershed bounded by null values

will not yield fragmented subwatersheds within the accuracy of this new process. The elevation cells that make up the perimeter of your bounding watershed should be included. Expanding the extent of your elevation input so that most of the general basin is included will help a lot in providing you with usable subwatershed characteristics.

Performance

The performance of this new process and the time needed to apply it to your elevation raster and project can be extrapolated from the following test results. The test data set used was the 16-bit elevation raster for the northern (top) 1/3 of the 7.5' **USGS** Hayward map quad. This test elevation raster is 369 columns by 164 lines. This Hayward **DEM** can be found on the Prototype2 of the sample San Francisco **TNTAtlas**. The test processing used a Gateway Pentium with a 133 megahertz processor and 16 megabytes of memory. The test elevation raster was read to and then processed from a hard drive (i.e. not from the **CD**). All the output files including 638 watershed polygons were created on the same hard drive in about 5 minutes.

DEM/ortho

Uniform Area Modeling

There is a new option to "Fill Lakes" that estimates the elevation of uniform areas, even if they are inclined and curved. Uniform areas (in terms of image features and character) occur in stereo images of any scale and scan resolution. It is not possible for cross-correlation or any other soft or analytic photogrammetric method to directly establish the elevation of the individual surface cells within such areas. However, such uniform areas still represent areas of topological variation which can be modeled or predicted from the edges of the area.

A lake usually produces a uniform image area whose image cells yield very low cross-correlation and strange elevation values. However, the edge of a lake shows up well in both images and produces good cross-correlation and elevations. The edges of a grassy meadow, some forest stands, tallus slopes, and other uniform areas also usually have well-defined boundaries. In the United States, most agricultural crops appear like lakes, providing large uniform areas with well-defined boundaries. In other nations agricultural fields may appear as uniform inclined areas on hillsides with well-defined edges. Modeling the elevation of the cells within these kinds of areas improves the **DEM**'s representation of the terrain.

Some terrain features will not be correctly handled in this approach. Examples of these would be a shallow mud basin or playa or a low sand dune which has little image character within its flat boundary. With automatic lake-filling active, these features will be modeled as flat, even though they actually represent depressions or low hillocks.

V5.30 contains an optional, automated method to model the interior elevation of uniform areas. It tries to find all areas larger than you specify with a cross-correlation coefficient below a limit you select. It then provides several optional surface fitting methods to model the elevation cells within these areas depending upon the characteristics of the elevation of the boundary it defines for the area. For example, it can fill in a lake as flat. It can also use bilinear methods to compute one bilinear surface through the boundary. A [color illustration is attached](#) to show the dramatic effect on the elevation values of the area of a lake when applying or bypassing this new option.

New optional means of handling uniform areas will be added to future versions of this process. For example you could simply draw around the lake in stereo and set its value to a known or **GPS** derived elevation. Similarly, the boundary of a depression could be drawn to establish its boundary and an interior minimum point established by **GPS** observations used to define its dish shape.

Posts and Holes

Posts and holes, or elevation noise, result from isolated small groups of cells which cross-correlate well due to image artifacts and not due to the parallax of surface features. An optional smoothing method has been available for reducing the posts and holes artifacts in the **DEM** (Step 2). This method uses multi-pass, local polynomial fitting to flatten out these areas of posts and holes. If pushed too far, the

smoothing method can have the effect of smoothing out the real terrain features.

A MicrolImages client recommended and proved that median filtering of the elevation surface provides good post and hole mitigation with little impact on the detailed elevation character in the **DEM** produced (e.g. loss of sharpness of contours in steep drainage). You can now choose either this new median filter method, or the earlier surface smoothing method, depending upon the nature of the terrain and your objectives.

Improved Terrain Definition

Improvements to the **DEM** modeling process (Step 2) now provide an elevation which has even better surface definition. Smaller surface fluctuations are now preserved, drainage features are better defined, and other such local elevation characteristics are captured.

* **Scanning (a prototype process)**

Direct support

If you have one of the older scanners supported directly by MicrolImages, then your scanner is still supported and will use this new program and interface to provide as many of the new features as possible for your device. However, it is possible that something in the previous older scanner support has been "broken" during its translation into this new process. Please contact software support regarding your next step if you are having problems with your scanner.

MicrolImages is still willing to consider providing direct support of new scanners. This quarter MicrolImages was forced by previous sales commitments to provide direct support for Howtek 2500 and 4500 scanners. These expensive scanners are advertised to have, and come with, **TWAIN** drivers. However, these drivers were found to be only partial implementations and were not yet even available for **W95**. Communications with Howtek eventually verified that they were putting little emphasis on this aspect of their product development [shortsighted at best]. Fortunately, and to their credit, Howtek was much more cooperative and organized than most manufacturers, supplying materials and assistance from which direct support of these devices could be developed.

Almost every time MicrolImages calls a scanner manufacturer to ask for the documentation for the control of their scanner, they laugh and say, "What documentation? We have a **TWAIN** driver: use it!" Most manufacturers have become unwilling to loan out their equipment which, while not absolutely required, its absence makes untested support tenuous and risky, particularly when its few users are in some other country. There are now so many kinds of scanners coming in and leaving the market every year that it is impossible even to keep track of them, let alone keep up their support.

Finally, it may seem that direct support of large and/or expensive scanners (color map scanners, high precision film scanners, etc.) might be the best approach, as there are not that many appearing each year. But, most of these manufacturers now interface their devices to an inexpensive **PC** with a network card. Scanning is then done off-line on the **PC** with their software, and the big image files downloaded from this **PC** to some other platform for analysis. This allows these expensive scanners to maximize their performance and special features; maximize their throughput; sell their control software in modules; and skip the preparation of second party interface software, documentation, and its troublesome support.

TWAIN support

The new **TNT** scanner process supports any scanner which has a valid **TWAIN** driver. Photoshop and other popular products now commonly support scanners (almost all), digital cameras (e.g. Kodak), external video capture devices (e.g. Snappy), and other image sources via their **TWAIN** drivers where the scanner and driver together define, and are referred to as a "data source". **TWAIN** stands for *Technology Without An Interesting Name*, and its structure and complex specifications are managed by a group of cooperating manufacturers, including Hewlett-Packard. The HP web site at <http://www.twain.org> is one place from which the extensive **TWAIN** description, discussion, and specifications can be

reviewed and obtained.

TWAIN drivers are complicated and are provided by the hardware equipment manufacturers who have varying levels of skills in writing good software and/or firmware. It is also common that a manufacturer in some other nation will simply produce the hardware and then sell it **OEM** to others who must then add the **TWAIN** driver. Thus some manufacturers have done a better job on their **TWAIN** driver than others, just as the characteristics, features, and reliability of their equipment also varies.

Standard Mode

A scanner or other device with a **TWAIN** driver is supported by **TNTmips** in one of two ways (standard and custom) depending upon the completeness of the driver. A **TWAIN** driver always has embedded within it the specifications needed to construct a standard user interface presenting the access to that equipment and its standard features. **TNTmips** supports the selection and use of these standard scanner interfaces built into the **TWAIN** driver by their manufacturer to create raster objects in a Project File.

This simple, standard approach is commonly used. It has to be reliable, or the scanner will not function correctly in anyone's product. Often a scanner or other imaging device will come with free control software which provides generic data collection using the standard interface built into its **TWAIN** driver by the equipment manufacturer. It is also common that "plug-in" modules can be obtained to allow popular software to present this standard **TWAIN** interface to support the scanner. All commercial software which uses the interface specifications built into **TWAIN** for a particular scanner will provide the same scanning functions and interface for that scanner.

Custom Mode

The standard approach will not necessarily provide all the specialized scanning features that MicroImages has learned over the past ten years that you want. Scanners vary greatly in the kinds of features they provide (e.g. number of bits per pixel). To gain access to these additional features, you can also select to scan via **TWAIN** using MicroImages' custom mode. Optional features in the scanner's **TWAIN** driver define these advanced features so that the **TNTmips** scanning process can construct an appropriate custom interface and provide its advanced features.

A complete and accurate set of parameters for the scanning device must be provided by the **TWAIN** driver (i.e. data source) for this custom scanning mode to work. Unfortunately, some equipment manufacturers take the attitude that all you need is their standard features via their free software (and built-in standard **TWAIN** interface). They do not carefully and completely implement access to the rest of the **TWAIN** driver features, and thus MicroImages' custom interface and features will not be functional. There is almost nothing MicroImages can do if a manufacturer's **TWAIN** driver is incomplete (just as with defective Windows display drivers). As you may be aware, many equipment manufacturers contract out for such drivers, and if the contractor does not get it right, then even they may not be able to fix it, and have often moved on to new things in this rapidly evolving business. However, under these circumstances, if you have purchased **TNTmips** scanner support, you will still be able to scan in **TNTmips** via the standard interface.

Custom Features

The following custom features are available via the direct support of older scanners and the custom mode outlined above. Some of these were available as noted in the earlier **DOS MIPS** product and are now reintroduced for use in **TNTmips**.

The number of lines/columns and estimated disk space needed are displayed for the area selected for scanning [from **DOS MIPS**].

Any changes to the contrast and threshold values are applied to the previous preview scan without requiring a rescan. This allows more rapid interactive adjustment of these parameters.

The scanning resolution may be selected by entering the hardcopy map scale and desired raster cell size [from **DOS MIPS**].

The units for the scanning resolution may be selected in dots-per-inch (dpi), (dots-per-centimeter (dpcm), and dots-per-millimeter (dpmm).

All scanning parameters (resolution, depth, scan area, etc.) are saved between sessions.

Scanning may now be done directly to **TIFF files** [from **DOS MIPS**].

Test Mode

MicrolImages has added a means by which you can test the accuracy and suitability of a scanner and its **TWAIN** driver. You can also determine the value and suitability of purchasing scanner support for the direct use of your scanner within **TNTmips**. Any user of **TNTmips** can now try, free-of-charge any scanner supplied with a **TWAIN** driver using the new scanner support via product level "**S0**". **S0** is included on every software authorization key and will let you select and use a scanner via **TWAIN** for either the standard or custom interface modes described above. However, since **S0** is a test mode, it will not allow you to scan or save a raster object greater than 512 by 512 pixels in size. **S0** does not provide a test mode for scanners for which MicrolImages has direct support, as MicrolImages' software, not the **TWAIN** driver, is responsible for the actual communication with these scanners.

If you have a scanner with a **TWAIN** driver and are considering purchasing the optional support to use it directly from **TNTmips**, then please test this approach via the **S0** option. Even more importantly, you may be considering buying a particular new scanner for use directly from within **TNTmips**. If you can somehow obtain access to the scanner, then **S0** will allow you to determine *in advance* the completeness of the **TWAIN** driver supplied with it, and how well you like this scanner. Perhaps you can borrow or otherwise obtain the scanner for evaluation. Alternatively, take your **TNT** product **CD** to the seller's site, install to operate **TNTmips** directly from the **CD**, and test the efficacy of the **TWAIN** support provided with that product.

Image Digitizing

Scanning, analog video capture, still digital camera, and direct access to other active image sources has been regrouped into a new process: Prepare/Digitize Imagery This process contains 3 menu choices: Scan, Video, and Capture **TWAIN**.

- 1) Scan will present the options outlined in the section above for the direct support of older scanners. It also provides those new scanners with fully implemented **TWAIN** drivers which can use the Custom Mode outlined above.
- 2) Video capture is the previous support of standard video cards such as the older **TARGA** boards. Support of the **TARGA** board for use under **W95** was not complete for release in **V5.30**. Unfortunately, it takes time to get old equipment to run under new operating systems. Those who have been awaiting this special retrofit should now contact MicrolImages via software support as the problem was to be addressed immediately after the shipping of **V5.30**.
- 3) **TWAIN** capture allows you to select any kind of image source whose **TWAIN** driver you have installed. It uses the Standard Mode and manufacturer's interface outlined above to control the scanning or image capture directly into **RVC** files. All scanners with a valid **TWAIN** driver for **W31**, **W95**, or **NT** should operate via this choice (a few **TWAIN** drivers are also available for **SCSI** devices for **MacOS** and **UNIX** platforms). The Snappy and other external video capture devices (not video capture cards) can be used to directly create raster objects in **RVC** files in this fashion. Digital still cameras from Kodak, Canon, and others also come with **TWAIN** drivers and can be captured live or transferred from memory or other on-board storage directly into raster objects.

* **SML**

SML is no longer a separate process and has been moved into the display process. This allowed the often requested and powerful display functions for all object and subobject types listed below to be provided. Since **SML** is now an integral part of the display process, it can directly access and use these portions of the display process.

SML in TNTview

Another aspect of moving **SML** into the display process is that it can also now be made available as an optional capability for those using **TNTview**. The users of **TNTview** can obtain this option to create **SML** scripts and useful new spatial processes not provided by MicrolImages. It also permits *any* **TNTview** system to run scripts created by *any* **TNTmips** system. Please see the main section above entitled **TNTview V5.30** for additional details and information.

Merging **SML** into display also released 5 megabytes of drive storage to you by eliminating duplicate

libraries. It is reasonable to surmise that similar consolidations will occur in the future, refocusing the **TNT** processes in fewer larger blocks. For example, during the next quarter, the **3D** display process will be integrated into this same **2D** process, and the whole will simply be referred to as the visualization process.

A selection of useful new features has been added to **SML** including the ability to display a raster, vector, **CAD**, or **TIN** object from within a script. A sample **SML** script illustrating a simple use some of these new functions is attached.

Object Functions

ObjectNumber(fname\$, objname\$, type\$)

Given a file name (fname\$), and object name (objname\$), and an object type (type\$, eg: "RASTER"), return the object number associated with that object. This object number is used by several of the new functions. If there is no such object, the function returns 0. The object types are listed in supplemental documentation. Some examples are "raster", "vector", "CAD", "TIN", "style", "georef", "histo", and so on.

SubObjectNumber(fname\$, parent, objname\$, type\$)

Like **ObjectNumber()**, but the 2nd parameter is the object number of any other object in the file to look under. This is useful for finding subobjects like histograms, georeference objects, etc...

GetObjectName(fname\$, objnum)

Returns a string containing the name of the object.

GetObjectDescription(fname\$, objnum)

Returns a string containing the description of the object.

SetObjectName(fname\$, objnum, name\$)

Allows you to change the name of the object. If you try to change the name to something illegal or already in use, it will get "mangled" in the standard way. That is, illegal characters are turned to underscores, and a number is added to the end if necessary.

SetObjectDescription(fname\$, objnum, desc\$)

Allows you to change the description of an object.

DeleteObject(fname\$, objnum)

Deletes the given object and all subobjects.

CopyObject(srcfname\$, srcobjnum, \$destfname, [parentobjnumber])

Copy object srcobjnum and all its subobjects from file srcfname\$ to destfname\$. The last parameter, parentobjnumber, is optional. If specified, the object will be copied as a subobject of parentobjnumber. If omitted, the object will be copied as a mainlevel object.

CopyObjectWithoutSubobjects(srcfname\$, srcobjnum, \$destfname, [parentobjnumber])

Same as **CopyObject()**, but subobjects of the source object will not be transferred.

RasterExists(filename\$, objectname\$)

VectorExists(filename\$, objectname\$)

These functions check for the existence of a Raster or Vector. They return true (1) if the specified object exists and false (0) if it doesn't. For other object types, the function **ObjectNumber()** can be used to determine if the object exists.

Display Functions

DispOpen()

Opens a display window. Returns a display number, which is required by other display functions. More than one display can be opened at a time.

DispClose(disp)

Closes the specified display window.

DisplayAddStandardTools(disp)

Adds the standard tools (Zoom box, slide view, and measurement) to the given display window.

DispRemoveAllLayers(disp)

Removes all layers from the specified display window.

DispSetTitle(disp, title\$)

Changes the title of the display window to whatever string you specify.

DisplaySetMessage(disp, message\$)

Displays a one-line message in the message box at the bottom of the display window.

DisplayRedraw(disp)

Same effect as clicking on the "Redraw" button in the display window.

DispRedrawFull(disp)

Same effect as clicking on the "Full View" button in the display window.

DispZoomIn(disp)

DispZoomOut(disp)

DispZoom1X(disp)

Same effect as clicking on the button with the same name in the display window.

DispGetMapScale(disp)

Returns the current map scale of the display window.

DispSetMapScale(disp, scale)

Sets the map scale of the specified display window. But does not redisplay.

DispQuickAddRaster(disp, fname\$, objnum)

DispQuickAddVector(disp, fname\$, objnum)

DispQuickAddCAD(disp, fname\$, objnum)

DispQuickAddTIN(disp, fname\$, objnum)

Adds a layer (Raster/Vector/CAD/TIN) to the display window) Does not redisplay. You have to call DispRedraw() to do that.

DispQuickAddRasterVar(disp, Rast)

DispQuickAddVectorVar(disp, Vect)

Similar to above functions, but takes an SML Raster or Vector variable.

DispAddButtons(disp, button1\$, button2\$, ... buttonN\$)

Adds a row of buttons to the bottom of the display window. Other SML functions can be used to detect when a button is pressed. The buttons will have labels specified in the function parameters.

DispLastButtonPressed(disp)

This function is to be used in conjunction with DispAddButtons(). It returns a string that contains the name of the last button pressed, or an empty string ("") if nothing has been pressed. Subsequent calls to

DispLastButtonPressed() will return the same string until the user clicks a different button. This can be reset by calling DispResetButtons().

DispWaitForButtonPress(disp)

This function is to be used in conjunction with DispAddButton() This function waits for the person running the script to press one of the buttons at the bottom of the window. When they do, it will return a string containing the name of the button pressed. Also, if the user closes the display window (using the View/Close menu option), this function will return the string "close".

DispResetButton(disp)

This function is to be used in conjunction with DispAddButtons() This function "forgets" the last button pressed so that the next call to DispLastButtonPressed() will return an empty string ("").

Writing to database tables

You can now write into an existing database table in SML. Here is an example script:

```
#
#
#
#
#
GetInputVector(V)
for each poly in V begin
V.poly.Linker.TRSS$ = sprintf("%s%s%d", V.poly.PAT.Township$, V.poly.PAT.Range$, V.poly.PAT.
Section)
end
```

This script combines three fields from one table and writes the result into # a new record in another table. The new record is automatically attached # to the polygon.

Element data in Query

The following functions are now available in database Query.

GetVectorNodeLineList(vect, lines, node)

Gets the list of lines attached to the specified node. If used in a query on nodes, or in a "for each node" loop in SML, the 3rd parameter (node) is implied and can be omitted. The 2nd parameter is an array which the function will fill in. This array must be defined before the function is called (See the example below). The function returns the number of lines for the node.

GetVectorPolyLineList(Vect, lines, poly)

GetVectorPolyIslandList(Vect, islands, poly)

Similar to GetVectorNodeLineList(), but gets the list of lines or islands attached to the given polygon.

An example of the use of these functions is follows:

```
#
#
#
#
#
#
array LineList[10] # Size unimportant. Will be resized automatically.
```

If (Internal.Inside)

select = false # Don't even bother checking islands.

else begin

Get the list of Lines attached to the predefined vector Vect

num = GetVectorPolyLineList(Vect, linelist)

select = true # Assume it's a lake

for i = 1 to num begin

If DNLNTYPE is 2, the line is a shoreline. If not, we don't want to # select the polygon

if (Vect.line[LineList[i]].DNLTYPE <> 2)

select = false

end

end

select # return the result

This is a polygon selection query. It works on the Drainage Layer of the Digital # Chart of the World

(DCW) data. In this layer, the polygons don't have attributes # to tell if they should be filled (lakes) or if they're just an area where a river divides # and then reemerges.

* Printing

Windows Drivers

The **TNT** products for **W31**, **W95**, and **NT** now support the use of the Windows printer drivers. Similar to display board drivers, a Windows printer driver is developed, tested, and supplied by the printer manufacturer or someone they contract to prepare it. Neither Microsoft nor MicrolImages has anything to do with the development, validity, or testing of these drivers.

Almost every color printer sold today comes with Windows drivers for **W31** and **W95**. They are also commonly available for **NT**. Many commercial software packages use these drivers to provide a standard communication link to printers. Thus, it would not be advisable to buy a standard color printer without a Windows driver for your version of Microsoft Windows.

The printer setup dialog box presents a pair of radio buttons at the top to select to use the printer in either printer or plotter mode. When you are operating in **W31**, **W95**, or **NT** a third radio button automatically appears labeled "Use Windows Printer". When this new button is not selected, the "Model ..." printer button brings up a list from which to select a printer directly supported by a MicrolImages' driver. If the "Use Windows Printer" button is selected, the "Model ..." button will bring up the "Windows Print Setup" dialog box. Use this dialog box to select which printer to use if you have more than one attached. Also select the appropriate paper size. Depending upon the printer you select and its features, there may also be other settings that can be confirmed or changed such as resolution, paper tray selection, and so on.

Snapshot Printing

This new printer support means that a wider selection of printers is now available for use by the **TNT** products. It also means that a free, basic level of snapshot color printing [product **P0**] is now available in **TNTmips**, **TNTview**, and **TNTatlas** and in the **TNTlite** products. Previously, MicrolImages' support of printers was confined to those few printers for which we had written direct drivers, or to expensive Postscript printers. This limited the general utility of such a snapshot printing feature. Now the direct, Postscript, and the ubiquitous Windows drivers can be used for this kind of color printing in any **TNT** product.

The new color snapshot printing capability will print an area of 1280 by 1024 pixels or smaller directly from your screen to a page size of up to 8.5" by 11". A sample color print entitled "**New Print Snapshot... Feature**" is attached to illustrate the results. It was printed directly on the **HP1200** from the screen by **TNTview**. The image, vectors, legend, and text boxes were layered into the View window and thus also were part of the snapshot and this print. Thus, if your layout puts it on the screen in the 1280 by 1024 pixel area or less, it will be printed. Because there is a sampling interaction between this limited number of screen pixels and the printels, you will find that small text has some distortions in this new feature.

All MicrolImages developed printer drivers are also still available and used for advanced printing. If a direct driver is available for your specific printer, it will usually provide more efficient, faster support, so use it. MicrolImages can, and will develop new direct drivers for printing on specific new printers. However, the rapid acceptance of Windows drivers by the commercial software industry has made it difficult to obtain the required development information and temporary access to test printers. Hewlett-Packard is the exception to this and provides excellent support to all software developers, which is one of the reasons their printers are the most widely supported and popular all around the world. All the other printer manufacturers, many of them outside the United States, simply tell MicrolImages and all others to "use the Windows drivers". While the Mac platforms are already supported via Postscript, there is no standard driver or interface defined for **UNIX** platforms.

Advanced Printing

The cost of advanced **TNT** printer support via a direct driver or for a Postscript printer for levels greater

than **P0** (**P3** to **P20**) remains unchanged. They can still be determined by finding the product code "**Px**" in the tables supplied to each client and prospective client in the folder entitled "**TNT products**". Those who wish to use a Windows driver for such advanced printing can determine the printer support level required [product code "**Px**"] using the section below entitled "Prices".

Changes in Distribution of TNT products

Southern Africa--GEODATEC cc.

Microlimages is pleased to announce that the **TNT** products will now be sold in Southern Africa by the newly formed GEODATEC cc located at 19 Bartholomew Street, Grahamstown 6139, SOUTH AFRICA. Ask for Rob Harris at (274)612-4314 (same via **FAX**). GEODATEC (**Geo-Data Analysis, Training, and Evaluation Consultants**) has just been founded by Robin Harris and Clyde Arnold Mallison. Until recently both were faculty members of the Geology Department at Rhodes University and have used the **TNTmips** products in their teaching and graduate programs since 1992. The stated objectives of this new company will be "high level training and consultation services in geostatstics, ore-evaluation, project risk-analysis, spatial database management, **GIS**, remote sensing, image processing, field mapping, structural geology, and 3-dimensional ore-body modeling". GEODATEC will be provided a list of Microlimages' clients in Southern Africa and will contact you with information about their training programs. As always, Microlimages will continue to directly supply you with free software support.

Alabama

Delta Geographics in Alabama is no longer a reseller of the products of Microlimages.

New Image Printers/Plotters Supported

No new printers were directly supported during this quarter. All efforts in this area were concentrated on the new interface to all printers via the ubiquitous Microsoft Windows drivers.

New Scanners Supported

The Scanmaster model 2500 flatbed scanner has been directly supported (not via **TWAIN**) for **W31**, **W95**, and **NT** at product level **S15**. It uses a **SCSI II** interface only. It scans an area of 13" by 18" (38 cm by 46 cm) at 12 bits-per-pixel accuracy for real optical resolutions of 50,100,150, 200, 300, and 600 dots-per-inch. This device retails for \$15,000, and a transparency option is available for \$1000. It weighs 85 lbs or 39 kg.

The Scanmaster model 4500 drum scanner has been directly supported (not via **TWAIN**) for **W31**, **W95**, and **NT** at product level **S20**. It uses a **SCSI II** interface only. It scans an area of 11" by 11.8" (A4) at 12 bits-per-pixel at 40, 50, 80, 100, 125, 200, 250, 400, 500, 666.67, 800, 1000, 1333.33, 2000, or 4000 dots-per-inch. This device retails for \$25,000. It weighs 140 lbs or 63 kg.

Computers

Pentiums

The recommended standard Pentium for this quarter is the Gateway **P5-166** which is slightly lower in price than the **P5-133** of last quarter. This model received PC Magazine's editors' choice (on page 316 of the 23 April 1996 issue) from the 11 brands tested.

Gateway **P5-166XL**

for **V5.20** (\$4000)

Intel 133 Mhz Pentium
 16 MB EDO DRAM
 256 Kb cache
 1.6 Gb 9 ms DMA Mode 2 EIDE
 PCI Enhanced IDE Interface
 17" Vivitron Color Monitor (Trinitron, .26dp)
 64-bit Matrox MGA w/ 2 MB WRAM
 6X EIDE CD-ROM
 3.5" diskette drive
 28.8 FAX/modem
 Sound systems and speakers from Wavetable
 9-bay tower case
 keyboard and MS mouse
 W95, MS Pro. Office (w/ Access Db)
 3 year parts warranty

for **V5.30** (\$2900)

Intel 166 Mhz Pentium
 same
 256 Kb pipelined burst cache
 2 Gb 10 ms EIDE Hard Drive
 same
 same
 same
 8X EIDE CD-ROM
 same
 none
 none
 7-bay mini tower case
 same
 same
 same

Gateway now has Pentium Pros available. Their current top of the line is a **G6-200** (200 Mhz) at \$6500. This unit includes a fast 32-bit **SCSI-2** controller, a Matrox 4 megabyte display board, and a 21" monitor.

Portables

The best high-end portable computer for this quarter is the following Toshiba.

Toshiba Tecra **720CDT** (price unknown)

Intel 133 Mhz Pentium
 16 MB **EDO RAM**
 256 Kb level cache
 1.2 Gb removable hard drive
PCI system bus
 12.1 display of 1024 by 768 pixels, 64-bit graphics accelerator, full-motion video
6X CD-ROM
 28.8 **FAX/modem**
 16-bit sound blaster
 2 **PCMCIA** card slots
 Infrared data port
 button mouse
W95
 3 year warranty

Promotional Activities

Accordion Flier

Another edition of the [accordion style flier](#) has been printed, and a sample is enclosed. It will be used for several mass mailings being prepared. Its cover has been changed to the San Francisco Bay airphoto. The content is almost the same except for a few minor updates. The return card for the sample

atlas is now a separate color postcard rather than the less substantial tear-off coupon used in the previous edition.

Slicks

Also enclosed are two new single page simple promotional slicks on the **TNT** products and some of your testimonials. During this quarter, additional one page slicks of this type will be completed and printed.

[World Leaders Agree](#)

[Powerful GIS Made Easy: MapInfo + TNTmips](#)

TNTlite Packaging and Promotion

A simple package has been prepared in "beta" form for the fast and easy delivery of the **TNTlite** products. A sample is enclosed for your review but without a **CD** attached since you are already receiving the **V5.30 CD**s in a normal jewel case. This packet is all that will be delivered to those who order the **TNTlite** product.

The **TNTlite** product packet consists of a MicroImages' style 6" by 9" envelope. Enclosed within it is a single page folded cardboard description of the product to which the **CD** is attached. Also enclosed is a postcard which can be used to register as a user of the **TNTlite** product. These initial test materials are black and white. They will be converted to full color after this initial beta test of their appropriateness and content. Several additional pages of promotional materials for the **TNT** professional products will also be enclosed.

These packets will be provided directly by MicroImages without charge to some prospective purchasers of the **TNT** professional products. Most who request it will need to pay the \$25 shipping and handling charge. If they want it free-of-charge, it can be downloaded, copied over, or installed from someone else's **CD**.

MicroImages' dealers and existing users of the **TNT** professional products who wish to make their own distributions of these **TNTlite CD** kits can obtain them in quantities of 10 or more for \$5 each. Unless your distribution of **TNTlite** is urgent, you may want to try it for yourself and/or wait for the **TNTlite** program to be "tuned" for at least one quarter before an all-out promotion of this approach.

Those who register their use of the **TNTlite** product will be logged into a new separate master list. Information (leads) about these users will be distributed to dealers in parallel to, and on the same cycle, as the normal product leads. It is certainly MicroImages' hope that active users of the **TNTlite** product are better prospective client leads than the hundreds of regular "curiosity seeker" leads logged each month. A professional using **TNTlite** may motivate himself or his organization into obtaining the professional product. If several students register from a particular academic department, then that department becomes a candidate for the purchase of a "master" teaching unit from among the **TNT** professional products.

The **TNTlite** program is MicroImages' direct response to ERmapper's significant investment in demo **CD**s, **ESRI**'s free ArcView products, **ERDAS**'s give-away and long term loaner program, low but limited use products, and the related marketing oriented activities of similar competitors. MicroImages expects to get a lot of feedback, most of it good, on the **TNTlite** program and products. It is hoped that our approach will ultimately be judged by you and the world to be of more intrinsic value and contain less marketing hype. A wider campaign to promote the **TNTlite** products can be undertaken based upon the feedback received from its gradual introduction over the next 3 to 6 months. For example, large scale direct advertising could be placed offering the **TNTlite** products much more widely.

Prices

Quotes

It is important to include your **TNT** product's serial number found on the software authorization key when requesting a quote for an upgrade to add a feature. If you fail to include this number, then it will be requested, as we have no way of identifying your system to determine what is involved. Communicating with you to obtain this number, after the fact, will delay processing your order.

Impact of TNTlite

The separate MicroImages **MEMO** dated 25 March 1996 entitled "Announcing **TNTlite**" describes to you (clients and dealers) the justifications for, and advantages of, the **V5.30** release of the new **FREE TNTlite** versions of **TNTmips** and **TNTview**. MicroImages and its dealers will continue the clear pricing policies and limited discounts as set forth in the section of the **TNT** products brochure entitled "*Clarification of Price Policy*". This folder and policy has and will continue to be distributed to each party requesting information on the **TNT** products.

Uncontrolled price discounting, differential pricing policies, favoritism in pricing, illegal software duplication, and other related short sighted business and marketing practices damage everyone involved. Yes, even the purchasers of discounted software are ultimately affected by driving the prices down, thereby reducing the funds available for product evolution, longevity, professional support, and so on. **TNTlite** is MicroImages' compromise answer to these diverse pricing policies and marketing tricks. The release of **TNTlite** does not change or alter the pricing or marketing policies of MicroImages for the **TNT** professional products.

A serious user of a **TNT** professional product is going to invest a lot more money in its successful use than the price of the software. In the long run, the time you and your staff spend learning to use and profit from a complex product costs more than any other component. Your investment is best protected in the long run by taking a look at the real prices of each major component in your spatial data analysis system.

Hardware. **PC** hardware has become a commodity which doubles in capacity every 2 years (e.g. in megahertz, megabytes, ...). It is therefore justifiable and in some cases mandatory to discard and replace it every 2 or 3 years. Of course, this is not the case with enterprise-oriented **UNIX** workstations and is the reason their performance and market are being usurped by **PCs** in complex, single user applications.

Training and Experience. The cost to train yourself and your staff in the professional use of any serious spatial data analysis software and the accumulated experience in its use is a real cost which is much greater than the software and hardware combined.

Data. The cost of creating, editing, and organizing the data sets for a single professional project often also exceeds that of the software and hardware combined.

Software. When you consider the sum of these costs of the hardware, training and experience, and data creation, you want to buy that spatial data analysis software product which:

- evolves semi-transparently with the rapidly changing hardware and operating systems;
- changes gradually, maintaining as much backward compatibility with your old data sets as possible;
- has professional support;
- is not free to your competitors with less integrity;
- is not discounted;
- is provided via a responsible dealer network;
- provides fast corrections for defects;
- is not all marketing hype;
- does not waste your money on irresponsible marketing;
- keeps you informed; and so on and on.

In other words, you want a responsive product from a responsible, professional company. MicroImages is now completing its 9th year in business and, while far from perfect, has and will be measured by these criteria.

Product Trade-ins Sought

MicroImages now has sufficient staff and time to begin to seek the truth about the capabilities of competing software packages at all levels. This will allow these other products to be carefully examined for superior performance in some areas, innovative features, more intuitive interface components, and generally good ideas. Certainly other developers of spatial data analysis software have their good ideas and approaches.

It is easy to simply purchase the \$1000 to \$2000 software packages, and MicroImages has already done so. The new theme mapping option in **V5.30** reflects some of the ideas found in these other products. MicroImages has and will sell its products to competitors who are above board about this, and generally they also respond similarly. However, simple economics apply to the purchase of the more expensive products and their associated pricing policies. MicroImages' controlled pricing means that we expect to get the same thing as we give. For this reason, and the fact that we are a competitor, the prices of their products are at list (if you can get a list out of them), if they will cooperate at all. This is only reasonable and expected. But, when others are getting really big discounts, MicroImages reacts much as you would react.

As a result, MicroImages is soliciting trade-ins of one each of our competitors high-end spatial data analysis products for the **PC** or **UNIX** workstations. On a first-come, first-served basis, MicroImages will discuss applying 100% of your actual purchase price of their product toward the purchase of MicroImages' products. Your proposed trade-in product must meet the following conditions.

- It is the current version of the product.
- Your license to the product can be legitimately transferred to MicroImages so that future upgrades for the product can be subsequently purchased directly from its manufacturer by MicroImages. For example, a discounted educational product probably could not be transferred or upgraded. You will need to check how you got your version, the license which you signed or accompanied it, or with its manufacturer.
- The original invoice showing the actual price you paid for the product is available to establish your trade-in allowance.

Cost-Sharing a New Feature

It has been pointed out in other MicroImages **MEMOs** and communications that there are about 1500 current requests logged in for new features for **TNTmips**. About half of them represent your suggestions over the past several years. The other half were logged from the internal planning processes at MicroImages. Each quarter some are completed, but even more are added. Most of these requests are of the nature "wouldn't it be great if **TNTmips** could ...". A few are big tasks which require creation of whole new subprocesses such as the theme mapping and **COGO** being added this quarter.

MicroImages is gradually reaching a position where it can undertake the reduction of the size of this list. However, what is done each quarter is a matter of priorities established at MicroImages by many diverse, mysterious, and often unexplainable means. Some choices are made by MicroImages' management, some by the individual software engineer, some by client voting, and so on. One possible way to get a new feature which is important to you is to cost-share its development, thereby moving its priority way up on the list.

Many of you already know that MicroImages will not do "work-for-hire". We are asked every month to do a project, write **SML** scripts, etc. on a contract basis. The answer continues to be "no" as this is not commensurate with our goal to expend all our corporate energy to provide all our clients with the most advanced software possible. This has led to a policy that the only kind of contract work which will be undertaken is that which adds features to the **TNT** products which become immediately available to every user (via the next quarterly release). Infrequently, MicroImages has refused a request to cost-

share the addition of a feature to the **TNT** products which would only benefit a single user or organization. For example, a contract would not be accepted to add an import for a data structure which was created by, and unique to, a specific organization. Adding such an import would not be of general benefit to the MicroImages client base.

However, money talks. So if you have an important new feature already logged on our list or not, which would help you and other clients in the use of a **TNT** product, it never hurts to request a quote on the cost of having it added in some agreed upon time framework. Please plan ahead and allow adequate time, as MicroImages has already committed to such projects and also has to set up its own internal priorities many months in advance to meet each quarterly release cycle. MicroImages sometimes has these contracted-for features undertaken on overtime.

A contract project is undertaken because it produces a feature judged potentially useful to, and always available to, all MicroImages clients (present and future). As a result, MicroImages will contribute one-half the price of any such cost-shared project in exchange for the benefit we derive from it. The minimum cost of any such project to a client will be \$500 matched by a similar amount by MicroImages due to the large amount of time such contract projects require to negotiate, plan, set up, complete, release, iteratively test with the buyer, and so on, regardless of how simple they may seem at first glance.

Price Changes

Scanners

The new scanner process in **V5.30** continues to support all previously available scanners supported by **TNTmips**. If you have purchased a "scanner support feature" product level "**Sx**" it will still be authorized by your software authorization key. All other scanners on the table in the **TNT** products folder continue to be available and can be operated under the same "**Sx**" product level.

Support for all new scanners to be operated directly from within **TNTmips** will still require purchase of the appropriate scanner support feature. If you have already purchased one of these support levels for your current scanner, then you also have the option to switch to use any scanner with a **TWAIN** driver within the product support limits noted below.

The principal purposes of buying MicroImages' scanner support are to scan directly into raster objects, for possible improved features, to use only one software package and learning curve, to use on your specific computer and operating systems, to use on more than one kind of system, for direct integral access, etc. Remember that you do not need any scanner support if you use some other product to scan into a format such as **TIFF** which can be imported into raster objects in a Project File.

The new product codes for direct support of a color scanner via its manufacturer supplied **TWAIN** driver are:

S0 at no charge to scan up to 512 by 512 pixels.

This S0 product code allows minimum area and test scanning in both the **TNTlite** and professional versions of **TNTmips** without cost.

S3 will permit scanning up to 2700 columns and 4200 lines.

(at 300 dpi this is an area of 9" by 14")

S7 will permit scanning up to 6000 columns and 8400 lines.

(at 600 dpi this is an area of 10" by 14")

S15 will permit unlimited scanning in columns, lines, and at any available dpi.

- dpi means dots-per-inch.
- Both column count and line count limit separately, not the product of them.

Prices to add the direct support of older scanners shown on the table in the **TNT** products folder remain unchanged. Please consult your **NAFTA** Prices or International Prices sheet, your dealer, or MicroImages to determine the cost of the scanner support level you require.

Printers

The addition of support in **V5.30** of the Microsoft Windows printer drivers, addition of base level color

printing into all **TNT** products, and the release of the **TNTlite** products requires a change in the pricing policies for the use of color printers in **TNTmips**. If you have purchased a "printer support feature" product level "**Px**", it will still be available via your software authorization key. All other printers on the table in the **TNT** products folder, and other direct printer support which might be added, continue to be available and can be operated under the appropriate "**Px**" product level.

Support for all printers to be operated directly from within **TNTmips** via drivers supplied by their manufacturer for use by Microsoft Windows will require purchase of the appropriate printer support feature. If you have already purchased one of these "**Px**" levels for your current printer, then you also have the option to switch to use any printer with a Windows driver within the following product support limits.

The new product codes for direct support of color printers via its manufacturer supplied Windows driver are:

P0 at no charge to make direct color prints via a snapshot of the screen only.

This **P0** product code is automatically authorized without charge for the professional and lite versions of **TNTmips**, **TNTview**, and **TNTAtlas**.

P3 gives dithered color printing at 300 dpi up to an 8.5" by 11" (or A4) area.

P5 gives dithered color printing at 600 dpi up to an 11" by 17" (or A3) area.

P10 gives dithered black and white printing at any dpi for any area.

P10 also gives continuous tone color printing at 300 dpi up to an 8.5" by 11"(A4).

P15 gives dithered or continuous tone color printing at any dpi for any area.

- dpi means dots-per-inch.
- Both page dimensions separately limit, not the product of them.
- Dithered printing produces prints directly and via 4-bit print files. Select dithered printing for use with printers which print each color printel (color dot) separately from a fixed ink color.
- Continuous tone printing produces prints directly and via 4- and 24-bit print files. Select continuous tone printing for sublimation, photographic, and other printers which directly print a variable color printel (printed dot) without dithering.

Prices to add the direct support of older printers shown on the table in the **TNT** products folder remain unchanged. Please consult your **NAFTA** Prices or International Prices sheet, your dealer, or MicroImages to determine the cost of the printer support level you require.

Articles Citing MicroImages' Products

Please send a reprint or a reference on your publications that contain references to the use of **TNT** products. This will enable MicroImages to cite it here, and all can review the type of applications being made of these products.

Predictions of Adult Anopheles Albimanus Densities in Villages Based on Distance to Remotely Sensed Larval Habitats. 1995. by Eliska Rejmankova, Donald R. Roberts, Anitra Pawley, Sylvie Manguin, and Jorge Polanco. Am. J. Trop. Med. Hyg., pp. 482-488.

Study on the Basin Runoff And Inundation Models for Gia-Yie Area (III). 1995. by P.C. Chou. Technical Report No. 202. Hydraulic Research Laboratory, National Taiwan University. 99 pages.

Improving Prairie Pond Counts with Aerial Video and Global Positioning Systems. 1995. by Lawrence L. Strong and Lewis M. Cowardin. Journal of Wildlife Management, 59 (4):708-719.

A LANDSAT MSS-Derived Fire History of Kakadu National Park, Monsoonal Northern Australia, 1980-1994: Seasonal Extent Frequency and Patchiness. by Jeremy Russel-Smith, Paul G. Ryan, and Richard DuRieu. accepted for publication in the J. of Applied Ecology in 1996. 37 pages in draft.

Staff Additions

Steve Sizer has just departed from Microlimages' software support engineer team where he was its team leader. Steve is getting married this fall to Dr. Patricia Reed in Omaha where her practice is located and where they will set up their new home. He has a new job as a systems engineer for Hughes Engineering, a defense contractor setting up new facilities for Global Weather Central at Offutt Air Force Base in Omaha (formerly the home of the Strategic Air Command). Steve started at MicrolImages 5 years ago during his senior year of college. Over the intervening years he has made significant contributions to the smooth operation of MicrolImages and the evolution of the products. His expertise in how to make the **TNT** products work for you will be missed by all.

Steve is being replaced as the software support team leader by Kevin Royal who will now be getting all the tough questions. Until the new software engineers hired this quarter are sufficiently experienced, Terry Peterson and Ron Souliere, both old hands, will be helping out part-time in providing software support.

Kurt F. Bottger has just joined Microlimages as a software support engineer. He will be helping clients via the software support team. Kurt obtained a Bachelor of Science in Industrial Engineering from the University of Nebraska at Lincoln in 1987. During the first years following graduation, Kurt worked in private companies in the area of environmental health and related testing programs. From 1991 until joining Microlimages, he has been employed in the Nebraska Department of Health. During the last several years of this employment Kurt was responsible for teaching himself the operation of Arc/Info via **UNIX** and the subsequent preparation of maps and other products related to health, water quality, and other related issues.

Terry (TAB) A. Brown has just joined Microlimages as a software support engineer. He will be helping clients via the software support team. TAB obtained a Bachelor of Science in Civil Engineering from the University of Nebraska at Lincoln in 1990 and has completed most of his courses for a Master of Science in Civil Engineering specializing in Water Resources, also from the University of Nebraska at Lincoln. From 1989 until joining MicrolImages, he was employed in the Lincoln office of EA Engineering as a specialist in Hydrology and Water Resources. Most of his specific activities were in applying **CAD**, **GIS**, and computer models such as HEC-2, HECRAS, TR-20, TR-55, FESWMS-2DH, UNET, AGNPS, MODFLOW and others.

[The addition of the two experienced engineers to the software support team punctuates Microlimages' commitment to providing the best possible experienced professional support for our professional clients. It is not usual to get professionals on the other end of the support line. While these new engineers already know about the general application of spatial data analysis, it will take them a little time to become familiar with **TNTmips** on the job before they begin helping you.]

Testimonials

Following are some of the comments to Microlimages during the last quarter exactly as written except for the [edit] alterations in [brackets] to keep them anonymous. Obviously many more comments are received by Microlimages by voice but cannot be reproduced here verbatim as quotes. Please note that these quotations are not edited from their original form in spelling, grammar, punctuation, etc.

from a **FAX** from an international representative on 28 November 1995. (using **v5.10**)

"A friend in [a government agency] told me that we should do much more advertisement of MIPS because of easy-to-use and lots of functions of integration of Vector/Raster/CAD/TIN. He bought a PC ARC a year ago, but nobody install. Box, though beautifully, are left on the floor over a year. Combination of MapInfo and MIPS is a following wind."

[beautiful boxes do make excellent door stops, and describing a product as a "following wind" is an elegant description from the polite Asian world.]

from a **FAX** from an international representative on 29 November 1995. (using **V5.10**)

"This week I had and have two parties from [a city] for a TNTmips demo. They checked MapInfo and thought MapInfo is not suitable for their purpose of geoprocessing. Cartographic data must be made and updated during their projects, TIN is available (not in MapInfo), Feature Mapping, DEM creation, Orthoimage capabilities, Raster can be handled, and running on PC. One of the parties will use TNTmips in GIS projects by (government agencies) for southeast Asian countries."

from a **FAX** from an international representative on 5 December 1995. (using **V5.20B**)

"Just a comment. People who saw a scroll of records (CB_SOILS) of a Tabular View of database tables of **TNTmips 5.2B** said it is faster than the Windows version of ArcView 2. ArcView needs a workstation for fast scroll, the person said. Please complete the checkbox function that enables us to retrieve polygons in Display **2D** soon. We have a possible win over ArcView."

[The requested function is in **TNTmips 5.3** and **TNTview 5.3** plus many other related new selection procedures not in ArcView 2.1.]

email from an international representative on 6 December 1995. (using **V5.10**)

[the context of this comment is the introduction to Microlimages of a new professional joining this representative organization after working on the **ESRI** staff as a senior analyst and participant in the team creating the Digital Chart of the World and with 11 years of experience working with Arc/Info.]

"[a name] is impressed by and excited by the opportunity to work with **TNTmips**. I introduce [a name] to you as she will now play a key role in communicating with Microlimages on behalf of [the representative]. Please join me in welcoming her." [We do!]

from a **FAX** from an international representative on 6 December 1995. (using **V5.10**)

"It was gratifying that [a client] demonstrated his satisfaction as a new **TNTmips** client in this way. [He] has set up a **GIS/RS** program almost from scratch in an undeveloped and isolated part of the world. His task would have been far more difficult if were not for the outstanding quality of customer support provided by **MI**, which has also been an inspiration and model for my own business practices."

email from a U.S. client on 19 December 1995. (using **V5.2**)

"I just got my copy of **5.2** today and I am glad to see that you are doing your best on holding the stated upgrade cycle! I have been waiting patiently for **ESRI's PC** Arc/Info 3.5 only to get a vague statement that the fall date has been moved to 'early' 1996."

from a letter from a Taiwanese client on 29 December 1995. (using **V4.8**)

"I am [a name] from Taiwan, I used to work with [a name] at [a company] in 1992. During that year, you gave me lots of instruction on my job, particularly in the field of **GIS** research, which I applied to my work since then. I really appreciate the solid concepts and methodology infused by you and your company."

"with the goal of developing **GIS** continuously, I was supported by my present boss [a name] and have worked at the Hydraulic Research lab of [a university] since two years ago. So far we have successfully applied the **MIPS** package to the projects on 'Study on the Basin Runoff and Inundation Models for Gai-Yi Area (III)', our co-research government agency, [an agency name] also pays high regards to the powerful function built in the **MIPS**."

[some details skipped]

"I appreciate the technical support your company gave me during the course of this project. Thumbs up to [a **MI** software support engineer's name], who always responded to my request and impressed me with his outstanding performance and expertise. I would like to send this report to you and the fellows in Microlimages Co. Welcome for any comments on our report. And I look forward to working with you in the future." [as do we]

from a **FAX** from an Angola client on 9 January 1996. (using **V5.20**)

"The new demo **SF TNTAtlas CD-R** is a smashing demonstration of the concept of how to present and distribute stacks of high quality interactive visual information."

"On the occasion of the turn of the year, I also wish to congratulate you and your team for the well deserved success crowned by **MI**'s growth in 1995. Your team constitutes an example of the right way to develop complex specialist software products for a rapidly evolving universe of applications. Through each release of successive upgrades, **MI** manages to convey renewed enthusiasm directly to the end client like myself."

from a **FAX** from a Ugandan client on 5 January 1996. (using **V5.10**)

"Our lab is using **TNTmips** for some time now and we are rather satisfied with it. Therefore, we plan to buy a second **TNTmips** software package which we would like to use then for educational purposes since the system is more conformable, powerful and easy-to-learn than many other products on the market."

from email from a South African client on 9 January 1996. (using **V5.20**)

"I would just like to say that I am extremely pleased to hear that **SMI** and MicroImages have come to some formal agreement to allow Atlas **GIS** files (**.BNA** and **.AGF**) to be directly imported into **TNTmips**. I truly believe that this is a strong relationship which will benefit both users of Atlas **GIS** and **TNTmips**. They are both very good packages and will start to place pressure on some of the larger **GIS** systems in the functionality that they provide."

from a **FAX** from a U.S. client on 16 January 1996. (using **V5.20**)

"The impetus for this [**FAX**] is our dissatisfaction with **ESRI** ArcView 2.1. ArcView does not handle multiple projections as seamlessly as **TNTmips**. We would like to use **TNTview** as a preferred front-end browser/query package. However, **TNTview** is missing some critical features when compared to ArcView 2.1. This request is to add these critical features to **TNTview** so we can provide it to our clients with data sets we generate. IN SHORT, WE WANT TO REPLACE ARCVIEW WITH **TNTVIEW**."
[The features requested were limited printing, interactive query tools, styles editor, import and export, and some text editor interfaces. All these items are planned for **V5.30** and **V5.40** of **TNTview** except for the text interfaces.]

from a **FAX** from a German client on 1 February 1996. (using **V5.20**)

"I received new key on 31 Jan 96 via **DHL**. Thank you for quick reaction. The interface speedup and ability of real multitasking using **W95** version are exciting"

from a **FAX** from a client in Kazakhstan on 1 February 1996. (using **V5.20**)

"Version 5.2 arrived safely at the end of December and installed without any problems."

from a **FAX** from an international representative on 17 January 1996. (using **V5.20**)

"I haven't had any significant problems with **V5.2** and now have it up and running on Windows 95 which I quite like and as you say is nice to use. I have been using **TNTmips**, **MS** Word plus other software and it seems to be multitasking quite nicely although it slows down the windows refresh rate considerably. This will be dependent upon the amount of **RAM** in the computer. I am quite happy with the speed and performance of **TNTmips** under the configuration I have. i.e. **P5** at 66 Mhz and 16 Mb **RAM** in fact there is an improvement in the interface opening/closing speed which is significant. This will postpone my decision to upgrade to a **P5**/120 for a time. I will probably wait now until the entry level **P6** is available which by the sounds of it will quadruple the speed from a **P5**/66?"

[The normal upgrade fee between **V5.10** and **V5.20** covered the cost of the application features added in that quarter. Thus, all clients received the **W95** version without direct charge except for some of you who had an old black key and upgraded it for the \$50 cost of the new replacement gray key. The net result of all this set forth clearly above is that this has saved many parties the money needed to upgrade their existing computer for a few more quarters.

MicroImages has not been provided with any opportunities for upgrading the software we use from **W31** to **W95** without direct charge. However, MicroImages is pleased when we can deliver this kind of result to our clients. We hope this successful transition to **W95** and associated performance increase will be accepted by all as partial compensation for problems you might have experienced with our products.]

from a **FAX** from a German client on 2 February 1996. (using **V5.20**)

"I am just testing **V5.2** for **W95** with great enthusiasm (performance of interface, real multitasking, etc.)."

from email from an Australian client on 9 February 1996. (using **V5.20**)
"Also I would really be interested in becoming a beta site for your beta versions of **TNT**. Is this possible [yes]?
"Say G'day from OZ to everyone, I really enjoyed the user group [**AUW8** meeting]."

from email from an Australian client on 9 February 1996. (using **V5.20**)
"Thanks for the assistance in getting the Windows 95 version working, It is very much faster than the Windows 3.1 and NT versions."
[It is likely that the **NT** version is now equally fast but his comparison was made with **V5.10** running under **NT**.]

from a **FAX** from an international representative on 16 February 1996. (using **V5.10**)
"I have changed my systems into Windows **NT**. **TNTmips v5.2** is under heavy use and is working OK so far. I am also still working on two Atlas projects, so I am going to order **TNTAtlases** in the near future. We have come also into point to move all the soil map production into **TNTmips** in [a country]."

from email from a U.S. client on 20 February 1996. (using **V5.20**)
"The marine science agencies have a particular interest in our applications of **TNTmips** because of the lack of versatile software to process their image data (video, sonar, and other versatile data). The work we have done with the various graduate students and their projects in the [a name] slough, along with the new side-scan **SML** program we developed for some offshore projects, has generated additional interest in this capability of molding **TNTmips** to the project instead of vice-versa."
"One current interesting project using **TNTmips** involves a group of 4 graduate students and 2 faculty who are currently in Antarctica testing the side-scan **SML** and **TNTmips** in an offshore bottom project that utilizes side-scan imaging sonar, a bottom profiler, **GPS**, and underwater video from scuba divers."
[the **SML** referred to here is the Spatial Manipulation Language built into **TNTmips**.]

from email from an Australian client on 28 February 1996. (using **V5.20**)
[The following message was received after several days of back and forth email to the software support team trying to determine why a **TNTmips** process continued to fail in approximately the same place. The failure could not be duplicated by the MicrolImages staff.]
"I've just got my computer setup again after about three days of stuffing around and I feel that the problem I had is directly related to the above error. Your right about it being an internal problem but it wasn't a bad SIMM. After getting a few more errors like the one above and getting them more repeatedly, it degenerated into rebooting itself for no reason. It quickly degenerated further into rebooting itself every minute or so. I thought that this looked like a virus but couldn't find one so I reformatted the **HD** but the problem still continued. Ended up picking up the computer and heard something banging around inside of it. All this was caused by the cooling fan for the **CPU** which had fallen off!!!"
[Complex software challenges healthy hardware, but it's a real headache on sick equipment. This also is not an isolated example of the types of non-MicrolImages problems addressed by the software support team at MicrolImages.]

from a **FAX** from a Mali client on 14 March 1996. (using **V5.20**)
"Thanks for your suggestions in your fax of March 7. I tried out all of them, but to no avail, however. I finally figured out that the culprit is the Ram Doubler programme, which I installed not so long ago. Deactivating Ram Doubler in the SYSTEM.INI file solves the display problem. As for the lock problem, that was indeed just a question of unlocking the project file with the File Maintenance module. Everything is back in order now, but I've gone back to using stripped down setup (without the **NDW** shell) for **TNTmips** sessions and another one for the regular office work. I will also follow your advice of updating the Number Nine graphics driver. The problem with Number Nine is that their hardware is usually well ahead of the corresponding software; that board has given me problems before, all related to the driver."
"We are looking into moving up **TNTmips** (and a projected purchase of Datamine) to a Pentium Pro Windows **NT** workstation, which should take care of some of the hassles related to the old Windows and all the little add-ons one needs to increase performance in Windows."
[The **RAM** Doubler referred to here is the version for the **PC** and Windows. The poor results reported should not be confused with MicrolImages' continued recommendation of the use of **RAM** Doubler for

the **MacOS** platforms. In a recent review in PC Magazine all **RAM** expansion software was shown to be of limited, and sometimes negative value, with Windows 95.]

from a **FAX** from a German client on 18 March 1996. (using **V5.20**)

"First let me tell you that after using **TNTMIPS** for about two months I am convinced having bought the adequate software package to set up my business as a freelance in **GIS**."

from email from a U.S. client on 27 March 1996. (using **V5.20**)

"We're using **TNT MIPS 5.2** on windows 3.1. First let me say how much I like the product. Very easy to use but very powerful. I am quite impressed. We recently moved from a way old version and the new version works very well. It took a while to figure out how to get it to work on our old Novell network system but it does work fine. I have one workstation running off **CD** and the others running on the file server. As I said, it works well except I have run into one problem."

[This email continues on to relate a problem related to the location of fonts. This client has taken over an academic installation designed, assembled, and sold to his predecessor 4 to 5 years ago by MicroImages. The installation provided to them and still used consists of multiple 486 computers of 33 megahertz with only 8 megabytes of memory. This new client who assumed responsibility for the installation and courses had extensive previous experience using Arc/Info.]

from email response from the same U.S. client on 28 March 1996. (using **V5.20**)

"Thanks very much for the speedy and professional reply. I knew there was a good reason we bought this product."

[MicroImages works hard to try to provide such service to all its clients. Unfortunately some problems and requests are much harder to solve than others, but none of them are forgotten.]

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