SCaNeWS

Southern California NeXT™ Users Group Newsletter

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Welcome to SCaN's first real attempt at a newsletter. We hope you find it worthwhile and will feel free to make suggestions or requests. Inside you'll find some comments on 2.0, a review of TouchType by our invaluable secretary and newsletter co-editor, Lorraine Rapp, a couple of "alerts" from NeXT, a comparison of PCs, Macs and NeXTstations for academia and a Mathematica tutorial, both by Dave Bradley, and many bits and pieces of info we garnered off the net in the past month.

INTRO TO SCaN

Mike Mahoney (mahoney@beach.csulb.edu)

The Southern California NeXT User's Group emerged from a loosely based group of students, faculty and staff at California State University Long Beach who took my seminars and wrote NeXT applications together in 1989-1990. In the style of BaNG and SNuG (Bay Area and San Diego NeXT users' groups), I came up with the name SCaN and invited NeXT and the outside world to a 9/27/90 meeting in Long Beach.

The turnout was of 45 people was pretty good for a first "outside" meeting. Rick Jackson of NeXT showed a video of highlights of the 9/18/90 Steve Jobs unveiling of the new NeXT products in SF and flawlessly demonstrated NeXTstep 2.0 on a 68040 NeXTstation. The second meeting, held in October at CSU Los Angeles, was very successful thanks to SCaN VP Bob Desharnais and Gary Novak. Gary is head of the Nuggets group at CSULA, who have done some neat things we'll discuss in a future issue. At CSULA we saw the power of NeXTstep in demos of Lotus' Improv, Ashton Tate's PowerStep, and WordPerfect (which is now shipping).

The third meeting was held at the CSU Northridge Matador Bookstore (thanx Glenn Horn and staff) where NeXTstations with 105MB disks are being sold in the low $3000 range for people associated with most CSUs and several junior colleges in Southern California. (Call CSUN at 818-885-4985 for further information. You can still get a free copy

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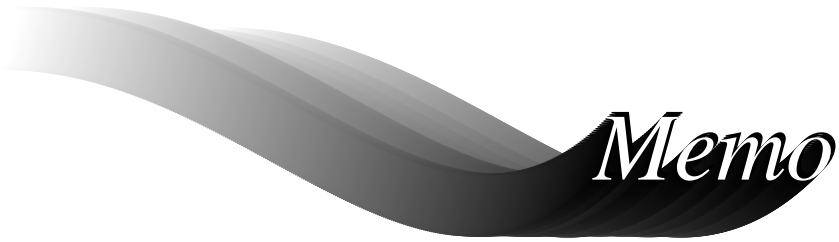

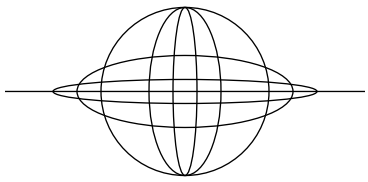

Originally sent to CSULB faculty and staff

From: Dave Bradley, SCaN member *December 1990*
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The NeXT as an Academic Personal Computing Platform

Evaporating disadvantages

When first announced, the NeXT had many advantages over its competition, such as Display PostScript, an optical drive, and the NeXTstep Interface Builder, which dramatically accelerates application development. However, they had a few disadvantages. Sluggish performance was most prominent. The upgrade to the 68040 processor (especially when accompanied by 16Mbytes of RAM) has turned the snail into a rabbit. (The Mac only rates the speed of a limpet on that scale). The price was steep, compared to PCs. Now the NeXTs are the clear price/performance leaders (see the systems comparison table). They came infested with bugs in release 0.8, but most of these have been exterminated, and hopefully no new ones have snuck in with release 2.0. The other primary complaint was lack of application software. This situation has substantially improved. I'll discuss each major application area separately:

Word Processing & Desktop Publishing

This is one of the NeXT's most famous strong points. The combination of the megapixel display with display PostScript for real time wysiwyg, and FrameMaker software led the Seybold report to declare the NeXT to be the best desktop publishing platform available. Recent announcements of additional software (such as WordPerfect, and QuarkXpress - a very high end publishing product) can only enhance NeXT's reputation in the area. *Note: This memo was produced with FrameMaker.*

Spreadsheets

Until recently a weakness, this is now one of NeXT's major advantages. Several products are available (such as Wingz, and Ashton-Tate's PowerStep), with Lotus' Improv receiving particular acclaim as the re-invention of the spreadsheet with unprecedented power, versatility, and ease of use.

Database Management

Offerings here range from inexpensive flatfile programs (eg. DataPhile) to full relational SQL based systems (Sybase, Ingres, and Oracle). A cartographic database with worldwide coastline, international, internal, and drainage system boundaries (MundoCart/ Optical) is also available.

Mathematical and Statistical Analysis

Although currently a deficiency area, this will soon be remedied when SAS and Systat become available. These are two of the best statistical packages anywhere, with excellent graphics support.

I expect the NeXT version to be far superior to the mere PC versions. In mathematical software, the inclusion of Mathematica with any NeXTstation sold to academic users is a major feather in the cap for NeXT. Inclusion of TeX also greatly aids mathematical document preparation.

Business Graphics

All of the spreadsheet packages provide extensive business graphics facilities. Use of PostScript throughout the NeXT provides for easy incorporation of these into desktop publishing applications. SAS and Systat will provide more powerful graphics tools for data

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MEMO

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analysis. Mathematica includes extensive 2D & 3D graphics as well. Freehand paint style graphics are included with the system.

Graphic Design

Display PostScript makes this an excellent product for graphic design and artistic rendering. The addition of color in a fully functional form (with thousands of simultaneous colors supported by a graphics coprocessor) exceeds the capabilities of PCs, even when equipped with expensive super graphics boards. With the announcement of Adobe Illustrator, TextArt, TopDraw, and Artisan for the NeXT, this potential can now begin to be realized.

CAD

This is one of the NeXT's weak points in software availability. Certainly, the rendering aspect of CAD is well covered with Illustrator and Artisan, but I am as yet unaware of any parts-design programs comparable to Autocad, or any integrated circuit design programs available on the NeXT. Presumably some will appear in the future.

CAI

The NeXTstep application development environment vaults the NeXT far beyond any competitor for simplicity of interface development. Computer aided instruction modules that involve simulation can combine the power of NeXTstep with Mathematica to cut development time by an order of magnitude over traditional programming. In addition, hypertext is now available for the NeXT with the HyperCube hypercard-compatible hypermedia product.

Artificial Intelligence

Allegro Lisp is available, along with NeuExpert, a combined expert system and neural network. Two other major products are under development: Graphic Knowledge Retrieval and NEXPERT.

Color Capabilities

Monochrome MS-DOS or Macintosh systems with comparable capabilities to the NeXT would cost about $2,700 more than the NeXTstation (see the comparison table). Color can be obtained more cheaply with PCs - in more ways than just price. To approach

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INTRO TO SCaN

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of Improv if you order before 3/31/91.) At CSUN we distributed copies of issue 11 of the NeXT User's Journal (a great publication from Georgia edited by Erica Liebman) and other information we'd received off the Internet.

At the 1/24/91 CSULB meeting we'll see an IBM RS/6000 running NeXTstep 1.0, gain further insight in NeXTstep 2.0 on NeXTs and distribute this newsletter. NeXTstep 1.0 on the RS/6000 is fast but lacks many of the NeXT's bundled application software. /NextApps contains only Interface Builder, Edit, and Terminal.

The basic goals of SCaN are to get together people who are interested in NeXTs, disseminate information (newsletters in particular), present on-line demos and with overhead projection, have 3rd party software and hardware vendors demonstrate their products, have a jolly old time, etc. We may also set up special interest groups for developers, desktop publishers, musicians, or others should there be a demand (let us know).

A proposal I wrote in September describing our goals was apparently enough to convince NeXT that we were serious (we are!) and they presented us with a Golden Nugget award. The $2500 award has and will continue to be used mainly to pay for mailings, copies of newsletters and net info for users who attend meetings, and of course refreshments. When the money starts running out (sometime this year) we'll have to charge dues--sorry.

Please let us know if you have any other ideas for meetings or would like to contribute to the newsletter. (Artists: the dude with the NeXT shirt could be a bit cooler.)

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Article submissions are encouraged..welcome...pleaded for! (contact the editors)

WHAT'S UP WITH 2.0

"Alarming" News from NeXT

NeXT Technical Alert 90-1

Summary

Cannot boot after upgrading a 68030-based 2.0 machine to a 68040: Upgrade2.0 doesn't install the 2.0 boot block.

Description

The Upgrade2.0 application in Release 2.0 does not write the 2.0 boot block to the disk being upgraded. The boot block is the first piece of code that's loaded from the disk after you turn on the computer; it handles the reading of the Mach kernel from the disk and the initial execution of Mach.

The 2.0 boot block supports 68040-based NeXT computers, as well as 68030-based NeXT computers; the 1.0 and 1.0a boot blocks support only 68030-based NeXT computers. If after running Upgrade2.0 you then install a 68040 upgrade CPU board, the machine will not boot. The symptom of this is the message:

Exception 5 (0x14) 0xaddress

You will see this during system start-up (address will be replaced by a PROM address). The message may be preceded by other error messages, including SCSI errors; these other messages may be ignored until after implementing the workaround, described below. After the Exception message is displayed, the system halts.

Workaround

After running Upgrade2.0, and before you reboot, run the Terminal application. If you logged in as root, omit the first line of the following; otherwise, type the following (plain text is output, boldface text is what you type; italic text will be replaced by an appropriate value):

hostname> **su**
hostname# **disk -b /dev/rsd0a**
disk name: *diskname*
disk type: fixed_rw_scsi

We recommend implementing this workaround even if you aren't upgrading to a 68040 now. That way, if you upgrade later, your system will boot correctly after you install your new CPU board.

If you have already tried to reboot, and got the error message described above, put the Release 2.0 optical disk in your drive and type:

NeXT> bod

at the monitor prompt. This will boot from the optical. Then perform the above steps.

NeXT Technical Alert 90-2

Summary

Printing from NeXT computers to printers on non-NeXT machines doesn't work with release 2.0. See workaround below.

Description

The lpr program puts print jobs into the spooling area, where they are picked up and printed by the UNIX printing server. The lpr program currently creates print command files that are incompatible with the standard protocol, so a non-NeXT machine cannot handle print jobs properly. The symptoms are that no print jobs to non-NeXT machines print.

Workaround

Log in to the system using your personal account. Run the Terminal application and type the following:

dwrite System Printer
    Resolution 1

The above command sets the default printer resolution to a nonstandard value.

You can now spool print jobs to non-NeXT machines.

Note: Even after applying this workaround, you won't be able to print to non-NeXT printers from the PrintManager application. Also, if you're logged in as root, you won't be able to print to non-NeXT printers from some applications(for example, Digital Librarian). There is no workaround for these cases.

If after using this workaround you subsequently print to a NeXT printer, the default resolution is reset and you cannot print to non-NeXT hosts until you perform the workaround again.

For More Information

Contact your organization's support center, or NeXT Technical Support.

2.0 FIRST IMPRESSIONS

My impression of NeXTstep 2.0 is overall very positive. The Workspace Manager (WM) was completely rewritten for 2.0 and it alone makes it worthwhile to upgrade. Its File Viewer (which replaces 1.0's Browser) contains an area called the Shelf, which can hold any icons of your choice.

The Shelf is like the Dock but much more useful because it can store any type of file or folder (as directories are now called), not just applications. I adjusted my Shelf to be able to hold two (sometimes three) rows of icons and store .frame, .wn, and .nib files in addition to folders (e.g. /NextDeveloper, ~/tmp) that I access frequently. About the only time I store an application on the Shelf is if it's one I'm creating - I usually use the Dock (or even AltDock) for apps. Make good use of this time-saving resource!

Michael K. Mahoney

To enlarge your Shelf first use WM's Preferences to make your Shelf resizable and then drag on the Shelf's knob. Other significant file management advantages of the WM are that files can be copied or moved using only one File Viewer and time-consuming operations such as copying are carried out in the background.

WM's new Tools menu contains some valuable resources for the non-UNIX person. You can now find files, get a listing of the running applications and background processes, and even activate a UNIX shell via this menu. UNIX gurus won't find these too exciting as they are simply interfaces to the UNIX find and ps commands which can be accessed more directly via the improved Terminal NextApp.

However, gurus will like Terminal's new scrolling, copy and paste capabilities which render 1.0's Shell NextApp obsolete. Unfortunately, the WM shells don't support VT100 emulation and aren't complete login shells (try the UNIX "who" command). In fact, when I tried to "talk" to another user I got the hilarious message "You don't exist. Go away."!!

The 2.0 user interface and its guidelines are more consistent and useful and are better defined. For a simple concise overview of them, obtain a copy of the /NextDeveloper/Examples/BusyBox folder and "make" the BusyBox app via a shell or Interface Builder (IB). Launch it and read the clearly stated guidelines in the help panel.

One user interface feature which surprised me is that the same drag event in the File Viewer will copy or move files, depending on the context. I guess I'll have to get used to this inconsistency. (Use Alt-drag for a sure copy.)
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Here are a few bugs and/or features I have found on Release 2.0. (Ask_NeXT has been informed.)

1) The declaration of atof() as a function returning a double is no longer made if you include <math.h>. In release 1.0, math.h included <stdlib.h> which contained the declaration. (It took me hours to figure out why my programs were producing funny numbers because of this little thing.)

OFF THE NET

Gerry Swislow
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2) /usr/bin/less does a core dump if you use the "E" command while running. The "E" command lets you examine another file. I replaced this "less" with the one from release 1.0.

3) The Icon application dies if you tickle the menus up and down. This is very peculiar.
There is probably just one sensitive spot on the menus and you just need to learn to avoid it, I suppose.

Editors' Note: The selection criteria for Usenet postings are based solely on their interest. SCaN makes no claim, explicit or implied, as to the accuracy of the information contained in these excerpts. We also assume that people who post on Usenet will enjoy seeing their words in print.

4) You don't get core dumps unless you do an unlimit core command from somewhere. I do it from a .login file for an interactive
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With the advent of high-resolution laser printers came the dream of professional quality printed output without the cost of a professional typesetter, a dream which awaited only the development of suitable software for its realization. As desktop publishing and typesetting products flooded the small computer market, however, many eager users confronted twofold disillusionment: the software was frequently difficult to learn and to use, and the often substantial disparity between an onscreen layout and its printed counterpart further compounded the difficulties.

Software Review: RightBrain Software's TouchType

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The NeXT's uniform use of PostScript to control both screen display and printer output has enabled text processing software developers to deliver more consistently on promises of "what you see onscreen is what you get from the printer." Ease of use, on the other hand, still ranges over a wide continuum, from powerful but somewhat daunting desktop publishing systems like FrameMaker to more intuitive text processing programs with more limited functionality.

RightBrain Software's TouchType falls into the latter category.
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INTRODUCTION TO MATHEMATICA ON THE NeXT

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The Basic Idea

Mathematica is a tool for manipulating mathematical expressions or formulas -- an extension of the hand calculator to higher level math. To use it, you just type in expressions and let Mathematica evaluate them. A wide variety of standard mathematical functions are available for you to use in building and operating on expressions. Numeric results may be obtained precisely (when rational), or to any specified degree of precision. However, the real beauty of this system is its ability to manipulate symbolic expressions.

When you enter Mathematica, you are placed in an empty window that forms your workspace or notebook for the session. As you type in expressions, and get their outputs, Mathematica keeps track of all your work. The entire session notebook can be saved, and recalled at a later time. You can then continue the work from where you left off.

Mathematica is sufficiently sophisticated to require a substantial time commitment to master all of its features. It is the culmination of a tremendous effort by its creator, Stephen Wolfram. It is *absolutely essential* that you have a copy of his book nearby when you try to learn this program:

Mathematica, A System for Doing Mathematics by Computer
Stephen Wolfram, 1988, Addison-Wesley Publishing Company, Inc.
Redwood City, CA

The book can be obtained at bookstores, software stores, or directly from Addison-Wesley @(800)447-2226

There is also some documentation available on the NeXT itself. A small portion of this material is included as an appendix to this handout. A variety of standard notebooks illustrating the capabilities of Mathematica are available on the NeXT, in the directory: *"/NextLibrary/Mathematica/Notebooks."* Several advanced function libraries, called "packages," also reside in *"/NextLibrary/Mathematica/Packages."*

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NeXT ANSWERS

The November release of NextAnswers is now available on the Internet archive servers. NextAnswers is a collection of answers to commonly asked technical questions about the NeXT Computer System. The topics covered include system administration, programming, and NeXT applications. When incorporated into Digital Librarian, NextAnswers will supplement the existing on-line and printed documentation, further helping you to understand and apply the power of the NeXT Computer.

We recommend that you obtain NextAnswers and have it installed on the NeXT computers at your site. (For those of you with access to the NeXT filesystem, NextAnswers will soon appear under /LocalLibrary/Organization.)

NextAnswers can be obtained two ways: by ftp from an archive server, or on an OD from NeXT if you don't have access to the Internet. We believe you'll find NextAnswers an invaluable source of information! If you have any problems obtaining it or installing it, contact NeXT Technical Support.

If you don't have Internet access, send an optical disk to:

NextAnswers
Technical Support
NeXT, Inc.
900 Chesapeake Dr.
Redwood City, CA 94603

Inside the directory we will send you is a file called INSTALL.wn that contains complete instructions on how to finish the installation.

If you do have Internet access, here are the instructions for obtaining it from an archive server. You can obtain NextAnswers via anonymous ftp (file transfer protocol) from one of the following Internet archive servers:

hostname : sonata.cc.purdue.edu
IP address : 128.210.15.30
directory : pub/next/docs

hostname : cs.orst.edu
IP address : 128.193.32.1
directory : pub/next/documents/
NextAnswers

There is an ftp site in Japan for our Asian customers:

hostname : etlport.etl.go.jp
IP address : 192.31.197.99
directory : pub/NeXT/documents/
NextAnswers

There are two versions of NextAnswers: a complete set, and a monthly supplement for those who already have the previous month's complete set. The former is called NextAnswers_-Nov_90.tar.Z and occupies 415K of disk space (1.52 Megabytes when installed). The latter is called NA_Supplement_-Nov_90.tar.Z, occupies 119K (733K when installed), and contains files that are new or changed since the October 90 release.

To obtain NextAnswers from an archive server, su to root in a shell and type the following commands. Replace "filename" with "NextAnswers_Nov_90.tar.Z" or "NA_Supplement_Nov_90.tar.Z" depending on whether you want the complete set or the supplement.

```
mkdirs /LocalLibrary
       /NextAnswers

cd /LocalLibrary/NextAnswers

ftp hostname-or-IP-address
       [see table above]

[Login:] anonymous
      [enter your own login name
       as the password]

ftp> cd directory
       [see table above for the
       directory name]

ftp> binary

ftp> get filename

ftp> quit

zcat filename | tar -xvf -
```

This will create a subdirectory of /LocalLibrary/NextAnswers called Nov_90. Inside Nov_90 will be a WriteNow file called INSTALL.wn that contains complete instructions on how to finish the installation, for both the supplement and the complete set.

The November NextAnswers contain entries relating to the 1.0 software release, as well as new ones pertaining to 2.0. The information below is contained in a file called CHANGES in the untarred directory:

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MEMO

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the rich, high speed color features of the NeXT, such as a 2 Megaflop graphics coprocessor, megapixel resolution, and 4096 simultaneous colors, would cost $1,900 more on a PC than on the NeXT. Even then you would not have some of the particularly valuable features, such as Display PostScript, and transparency support.

Sound Capabilities

The NeXT has superb sound processing capabilities, with its digital signal processor producing compact disk quality sound. It has already gathered tremendous momentum in the electronic music world. No mere PC compares to it.

NeXTdimension

This ultra high performance graphics board leaves all the above alternatives in the dust. It appears sufficiently powerful to outperform the very high end ($50,000-$100,000) graphics workstations previously available on the market. It includes 12-36 Megabytes of RAM, and a 33Mhz Intel i860 risc chip that is rated at 80 Megaflops. My guess is that this is 10-20 times the speed of the DEC 5810, and about half the speed of a small Cray, although it must be seen as a idealized throughput figure. This processing power supports fully interactive 32 bit color (with 16.7 million simultaneous colors and 256 levels of transparency for objects). Since it uses Display PostScript, you see on the screen exactly what you would get with a hi-res color printer. Moreover, the speed allows you to drag fully rendered objects around (not just their outlines). It has built-in video input and output, and real time video signal compression. These features make the NeXTdimension an outstanding hardware platform for applications requiring high color versatility, such as graphic arts and design, and scientific visualization. I expect significant software development to proceed in this area.

Networking

The NeXT networking capabilities far superior to ordinary PCs. Ethernet andTCP/IP are automatically included. The combined power of NFS (Network file system) and NIS (Network information system) unleash the full power of UNIX networking for the NeXT. This allows a user to sit down at a networked NeXT anywhere on campus, log in, and find their files readily available. Excellent electronic mail support (including attachment of documents, such as this FrameMaker memo) comes for free with the NeXT (unlike other PCs).

Conclusions

The NeXT provides an excellent computer for people who want one only to make them more productive, and do not wish to bother with the gory details of computer internals. This was the primary territory of the Macintosh, but they match neither the price/performance level, nor hardware/software power of the NeXT. On the other hand, the NeXT provides a software development platform unequalled by any other computer anywhere. The unique features of the NeXT make it beautifully suited for use by people in many disciplines:

- *Humanities:* Excellent text processing facilities, combined with the digital librarian (including the complete works of Shakespeare on-line), make it an ideal workstation for these users. Mathematicians will find Mathematica and TeX perfectly suited to their needs.
- *Fine arts:* Clearly the next is a first rate system for these users, with Display PostScript and illustration software for graphic artists, and fantastic sound facilities for musicians.
- *Natural and Social Sciences:* With the advent of SAS, and Systat to supplement the other features of the NeXT, it will become a highly attractive alternative for scientists.
- *Business:* Lotus Improv leads a collection of software (including simulation, decision support, and newswire analysis) that will be quite enticing to users from the school of business.
- *Applied Arts:* Special applications, such as Gray's anatomy on-line could serve these users.
- *Engineering:* The power of NeXTstep as a software development tool has already generated substantial interest among computer scientists on campus.

I believe that we should consider it as the primary system of choice for future purchases, avoiding fur

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MEMO

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ther involvement in the plain PC market as much as possible. I apologize for the unabashed advocacy here, but if you'd seen one of the new NeXTs in action you might share my enthusiasm.

Systems Comparison Table

The table below compares fairly standard, modern PC workstation alternatives to the recently announced inexpensive NeXTs. Notice that the NeXT is superior to both the MS-DOS and Macintosh versions in all performance categories, and in comparable system pricing.

	Zenith 386/20	**Mac IIsi**	**NeXTstation**
Basic System:			
Processor	80386	68030	68040
Clock (MHz)	25	20	25
Math Coprocessor	$450	$300	Included
Speed (Linpack Mflops)	0.4	0.2	2.0
RAM (Megabytes)	4	5	8
Hard Disk Capacity (Mb)	70	80	105
Floppy Disk Capacities (Mb)	0.72 - 1.44	0.80 - 1.40	0.72 - 1.44 - 2.88
Screen Size	14"	14"	16"
Screen Resolution	640x480	640x480	1120x832
Base Monochrome System Price	$3,999	$3,992	$3,399
Special Features:			
Ethernet Card	$300	$400	Included
Digital Signal Processor	$1000	$1000	Included
Bundled Software:			
Operating System	MS-DOS	Finder	UNIX
Window Manager	Windows 3.0	Mac-windows	NeXTstep
Display PostScript	Not Available	Not Available	Included
Digital Librarian	Not Available	Not Available	Included
Complete Webster's Dictionary	Not Available	Not Available	Included
C Compiler	$100	$100	Included
Mathematica	$700	$700	Included
Comparable System Price	$6,099	$6,192	$3,399
Minimal Color System:			
Simultaneous Colors	256 (@low res)	256	4096
Transparency gradation	Not Included	Not Included	16 levels
Base Color System Price	$4,299	$3,898	$5,999
Comparable Color systems:			
Graphics coprocessor board (hi res 4096 colors)	$1,500	$1,500	Included
Comparable System Price	$7,899	$7,898	$5,999

Note: The prices listed above are approximate. This is most notable for the graphics coprocessor boards, which may also differ in the total number of simultaneous colors per resolution, and may lack the NeXT's transparency support. The Digital Signal Processor pricing is a guess at the difference between adding a DSP card with A/D converter to a PC and the cost of adding just the A/D converted to the PC, since most PC DSP boards included hi res A/D. These are discounted educational prices for the systems.

FIRST IMPRESSIONS

(continued from page 5, column 1)

Programmers will find many improvements to rave about. Color support (a major topic in future issues), several new classes and additional functionality to existing classes in the Application Kit have been added. C++ support and new tools for measuring an app's memory and resource utilization have also been added.

I was delighted to find out that the "set" methods to initialize outlets in new classes set up in IB are no longer needed. Programmers are now encouraged to improve performance by using zones for better paging and extra .nib files for dynamic loading of info and help panels, etc. Interface Builder now provides support for the PopUpList, NXBrowser and NXColorWell App Kit classes and allows loadable palettes. I hope and expect to see a wealth of such palettes appearing on the net before long. If so, we'll pass them along. See the on-line appendices documentation in /NextLibrary/Documentation/NextDev/ ReleaseNotes for details.

I do have some complaints with NeXTstep 2.0, however. First, 2.0 doesn't seem any faster than 1.0 on an '030 machine (I'm dying for our upgrades). Apps seem to launch faster but a variety of other operations (e.g. Open, Save and Print panels) seem to take longer than before. I do like the extra options (e.g. Home, Fax) on these panels, though.

Interface Builder doesn't hide all the windows properly while in "Test Interface" mode and it actually died on me while I was editing a sound in the Inspector window. Scene, Icon and Grab (all written by that great talent and fontmaker Keith Ohlfs) are very creative and can be useful but have some idiosyncrasies. Grab should be able to print; Icon shouldn't die every other time I use it and its windows should not be partially hidden when launched; and Scene also dies and violates NeXT's UI guidelines with its Window menu (it should be File or Document). Scene, Icon (and also Yap) are important apps and I wish they were elevated to the NextApp support level. Another complaint is that the "Concepts" documentation is no longer on-line.

A number of other "bugs" are listed in comp.sys.next net messages included in this newsletter. We've verified many of their claims.

NeXT has won the Japanese G-Mark award for outstanding appearance, functionality, quality and safety, the Flugleman award for its software development environment, and now BYTE magazine has given them an Award of Distinction for the NeXTstation and NeXTdimension. The following is a quote from page 159 of the January 1991 BYTE.

"Steve Jobs has finally delivered on the original promise of the Next computer. These machines are fast and very inexpensive for what they do. Also, the applications coming out for them are, as promised, very hot. The Nextdimension, with its powerful graphics board incorporating an i860 and C-Cube CL550, will set a new standard for video and graphics performance. The Interface Builder remains the most enticing aspect of these machines.

These new systems point the way for advanced use of color display PostScript. Next has taken a leading role in the migration of expensive, powerful workstation technology to cheaper, desktop platforms. The integration of sound and real video is another area in which Next is in the forefront."

[Capitalization note: Even ByTE got it wrong! The N,X and T are always capitalized (e.g. NeXTstation, NeXTstep, NeXTdimension) except when directories (oops, folders) contain the name (e.g. NextApps, NextDeveloper, NextLibrary).]

The comment on Interface Builder brings back the memory of the first time I saw a NeXT over two years ago. I was really impressed with the graphics and sound demos but when I saw the power of IB and the App kit, I flipped! They not only make it much more pleasant for user interface designers and programmers, they also make the apps much better! Let's just hope that the world discovers NeXTstations and NeXTstep before it's too late!

NeXT Networking

NeXT workstations will get Netware client support next summer, NeXT chairman Steve Jobs said . The company is also working on client and server support for Apple's Ethertalk, which will allow users to connect NeXT machines to Macintoshes without using gateways.

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csh. Maybe there is some netinfo setting for it? You can also limit the size of core dumps. If the directory /cores exists and is writable, core dumps will be put there and named "core.pid" with pid being the process id.

5) Using telnet to talk to the NeXT from somewhere else (in my case a 386 running AT&T System V/386) and running "csh" on the NeXT has become quite flaky. The NeXT people say that they added something called stty -extproc that helps somewhat. It solved the problem of losing characters but if I type ^S to stop a scrolling screen, things often get hopelessly hung, requiring me to kill processes on the 386 end.

I had no problems with telnet on release 1.0a. "rlogin" still loses huge blocks of characters, -extproc or not. This was also the case on release 1.0a. Interestingly all these problems are only when running the "csh". If I type "sh", commands such as "ls -l /bin" do not drop characters.

6) The NeXT people say that the following is done on purpose, but it seems a little arbitrary to me. Anyway, you can no longer define a function that uses the same name as one of the C library functions or system calls in the shared library. Of course you can easily change the names of your functions in your code, but those old sources that provided their own versions of printf(), memset(), strchr(), malloc() or whatever will get a fatal error from ld when you compile them.

The NeXT people say they had to do this because of shared libraries. Sun shared libraries don't care if you redefine names, so it doesn't seem as though NeXT had to do this. In my code (which I port to every incarnation of UNIX) I had gotten tired of setting cpp flags as to whether a particular system used strchr() or index(), strrchr() or rindex(), memclr() or bzero(), etc., and so I just supplied my own versions of strchr(), strrchr(), etc. That worked fine until I compiled on 2.0. I have now changed the names of my routines to Strchr(), Strrchr(), etc.. No big deal.

BACKING UP TO FLOPPIES . . .

Lawrence Clarke
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Get a pen folks ... Here's how you can backup the 105 MB Hard Disk on the new NeXTstation to 1.44 meg floppies

1) initialize (format, put a filesystem on) approx 90 1.44 Meg 3 1/2" floppies. After they have a filesystem on them there's about 1.2 Megs free.

2) Turn on your NeXTstation and when the "Loading Disk ..." window appears, hit the right COMMAND key and the ~ key on the keypad at the same time. This puts you into the ROM Monitor. You'll get a NeXT> prompt. Enter

```
b sd -s
```

This boots from the SCSI disk in single user mode.

3) When you get to the # prompt enter

```
fsck
```

This checks that the filesystem is intact on the SCSI drive.

4) then enter the command that does the backup (you should label the disks before you backup 1 - 90)

```
# dump 0uOf 0.86 /dev/rfd0a
  /dev/rsd0a
```

this command dumps a level

- 0 full backup (zero)
- u update the /etc/dumpdates file
- O specifies the output block size (capital O)
- f specifies a device or file
- 0.86 is the block size for 1.44 meg floppies with filesys tem
- /dev/rfd0a is (r) removable (fd0) 1st floppy drive (a) 1st partition
- /dev/rsd0a is (r) removable (sd0) 1st SCSI drive (a) 1st partition

Once the SCSI drive is backed up you can use the command

```
# restore jixf filename /dev/rfd0a
```

to restore any files you want.

- j = media is ejectable
- i = interactive mode (question's asked)
- x = extract files
- f = specify filename

BUGS, BUGS...

Simson Garfinkel
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Here's a list that I've made of the bugs in 2.0:

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(contineued from page 11, column 3)

Problems with EMACS:

• .m extension doesn't automatically select C-mode anymore.

Problems with Webster:

• No iconify or close buttons (close should terminate application)

• Doesn't have autohide option for autolaunch.

Problems with Mail:

• Should support the .mailrc file. Or at least aliases; so I can send mail to "kwh" and have it automatically expanded to "kwh@amt.mit.edu" without having to mouse a half-a-dozen things.

• Should remember which addresses take NeXT mail and which don't.

• Summary matrix of articles should take FirstMouse.

Problems with Workspace:

• When new icons get created in the lower-right, they should be created as down and as right as possible. Right now, it seems to count across each time a new app is created. But if I delete a running app, it doesn't reclaim the space until it has gone all the way around...

• NeXT still doesn't have a screensaver...

Problems with Digital Librarian:

• 1.0 .index files breaks the indexer; it doesn't delete them, it just crashes.

• Doesn't have autohide option for autolaunch.

• Makes *another* directory in my home directory (~/Library), rather than putting bookshelves into the .NeXT directory.

Problems with Usermanager:

• Help screen says that there is a delete user option under the Windows menu, but there isn't.

Problems with Terminal:

• esc prefix is not the same as meta

• does not work properly with emacs. (in particular, scroll line up...)

Problems with EMACS & GDB:

• meta-D / meta-U / meta-S / meta-N work if you type ESC-D, but if you type a real META-D (because you have a copy of Stuart that does the right thing), then you have to press the META-D twice.

Problems with Terminal:

• Command-Q should ask you before it quits.

• Regular VT100 emulation doesn't work properly with emacs.

Problems with Interface Builder:

• If you close a nib file and have the Connections inspector out, you get trash in the Connections inspector

• You can't add a .tiff or .eps image with a space in its name.

Typos in documentation:

• in /NextLibrary/Documentation/NextDev/ReleaseNotes:
The "- alloc" should be a "+ alloc"

• in /usr/include/appkit/Cursor.h:
Should include "obsoleteBitmap.h", not "Bitmap.h"

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NeXTAnswers

(continued from page 7, column 3)

The following files in the November 1990 release of NextAnswers are additions or revisions to the October release. Some of the revisions are trivial.

NEW SINCE OCTOBER:

color.607
hardware.568
hardware.579
hardware.581
hardware.586
hardware.608
misc.558
misc.562
misc.567
misc.575
misc.587
misc.599
misc.603
netinfo.598
netinfo.601
objc.584
objc.591
objc.605
sybase.597
sysadmin.600
tiff.566
video.578

REVISIONS:

INSTALL.wn
README.wn
appkit.503
mail.451
misc.227
network.389.wn
sound.267
sysadmin.82
sysadmin.296
sysadmin.298
sysadmin.326
sysadmin.400
sysadmin.549
sysadmin.556
workspace.309

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Requests for Matrix:

• matrix should have a SelectedCellCount method which returns the number of SelectedCells.

MAC TO NeXT POSTSCRIPT FONT CONVERSION

Michael Callaghan

OK...Before I get too many more requests, here's how I made my Type 1 PostScript Fonts from my Mac work on the NeXT: (well, most of them work).

DISCLAIMER: You are ultimately responsible for your own actions. I take no responsibility for anyone who might decide to use these fonts on more than one machine, in violation of Adobe's licensing agreement.

Before I get into the hows, let me tell you what you need.

• A page layout program or similar that can print PostScript to disk. I used PageMaker 4.0.
• A word processor that can save in TEXT-ONLY mode. I used MS Word 4.0.
• Some way of transferring the TEXT files from the Mac to the NeXT. I used Apple File Exchange, to convert the Mac TEXT files to an IBM format. Then I put the IBM disk in my AT, and ftp'ed to the Cube. That was the fast way to do it. Kermit or such should do the job just fine.

OK...Now that you have all this, and think you can continue, read on...

I'm going to assume that you are using PageMaker 4.0 and Word 4.0. Sorry.

Open a New Document in PM. Select the TEXT tool. Type a word. I typed in the name of the font I was going to use. Select the text you just typed, and change the font with the font menu.

Continue to do so with each font you have, other than the ones that come with the NeXT (Courier, Helvetica, Symbol, and Times families). Make sure that you get every version of the typeface available (AvantGarde-Demi, AvantGarde-BookOblique, AvantGarde-DemiOblique, AvantGarde-Book --- You get the idea). The NeXT will automatically separate the type families from the type weights, and organze them for you just like Adobe Type Reunion on the Mac.

Now you should have a whole bunch of lines, each one in a different typeface. Save the document (you never know!). Now Print from the File menu. In the Print Dialog box, make sure you tell PM to print to a printer that you do not have attached to your computer. That is, don't choose Laserwriter or General. I told it a Linotronic.

That brings up another point: You must have Laserwriter chosen from the Chooser. Otherwise, Pagemaker, and I assume most other programs, won't have the PostScript option available for printing. Whether or not you really have a PS printer is academic at this point. You won't be printing anything.

OK...Now you have to tell the program to print the file to disk. IN PM, you click on the PostScript button. Deselect EVERYTHING you see EXCEPT Print PostScript to Disk and Download Postscript Fonts.

Give the 'Print to disk' file a name. Call it bunchafonts or something.

Go ahead and print. Your hard drive should whirr for a while, then stop.

Now exit this program and start your Word Processor. Open the file that you just printed to disk. You will see a very, very, very long document containing a mess of PostScript code. Here comes the fun part.

Somewhere in all that mess, are the lines

%%Begin Font
and
%%End Font

Guess what's in between those lines...That's right! Your font. The Begin font comment should also contain the full name of the font, so you don't really have to remember which order you printed them. Open a new window, and copy all the lines between the Begin Font and End Font comments into the new document. Save the new document, with the FULL NAME of the font. This will save you grief later. If you're using Word 4.0, make sure you use SAVE AS, and save as TEXT ONLY, not TEXT ONLY w/LINE BREAKS.

Once you've done this with all

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your fonts, you're ready to transfer the files to the NeXT. Do this however you can.

Once the fonts are on the NeXT, you face the most fun problem of them all. The end of line charater on the Mac is ASCII(13) (CR or ^M). On the NeXT, it's ASCII(10) (LF or ^J). If you used filters when you transferred the files, you may have been able to convert CRs to LFs. If you used an IBM filter, as I did, it converted CRs to CR/LF combinations.

Whatever happened, you now have to get rid of all CRs in the files, and replace them with LFs, assuming they're not already there. I have a program a friend of mine wrote that will do this.

OK...You now have a whole bunch of text files. Now you have to get Adobe to send you the corresponding AFMFiles. This is easy. Here's an example for getting AvantGarde typefaces from Adobe.

mail ps-file-server@adobe.com
SUBJECT: send AFMFiles AvantGarde-Book
send AFMFiles AvantGarde-BookOblique
send AFMFiles AvantGarde-Demi
send AFMFiles AvantGarde-DemiOblique
^D
cc:

This will tell the adobe file server that you want the above AFM files.

You have to do this for each typeface you want to use. I suggest doing the requests separately for each typeface, as the file the server sends back will be pretty long if there are too many requests.

The file the server mails back to you will be in the form of a shell archive. You just strip out the mail header, and issue a sh filename command from a shell window on the NeXT.

Copy the shell archive into your /LocalLibrary/Fonts/afm directory.

Copy the fonts you got from the Mac into the /LocalLibrary/Fonts/outline directory.

Unpack the shell archive using the /bin/sh 'filename' command. You may have one more problem left. The afm files I got from Adobe had the CRs in it. I had to run my little program on all the files once again.

Now, you should have two directories full of text files: the afm and the outline directories. Now cd to the /LocalLibrary/Fonts directory, and issue the following command:

buildafmdir .

This will tell the NeXT to make its own directory for the new fonts.

If you make it through all this without an error, most of your fonts should work. I still have three that do not.

If there are any specific questions, or you need the program, let me know.

X on the NeXT

Dany Guindi
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There has been a great deal of discussion recently concerning X11R4 on the NeXT and Pencom Software's role in providing it. Since others have seen fit to begin this discussion, allow me reply and clarify a few points.

• Yes! Pencom Software has announced and has a working alpha version of "co-Xist", an implementation of X11R4 under NeXTstep 2.0. This grey-scale version will be in beta in February and will be released in March. A color implementation is planned for a future release.

• Yes, we did consider providing some means of copy protection for the product. Ours is an imperfect world and people DO pirate software. But we're software developers, too -- and aren't particularly fond of copy protected software, either. For the first release, co-Xist will NOT be copy protected and site licenses will be available. We will review that policy for future releases based on our experiences.

As suggested, and what we considered ideal, we will be selling co-Xist at a low price per CPU ($149 for educational accounts, $249 for commercial accounts),

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(continued from page 14, column 3)

we will also make site licenses available and will support our product. We, to quote a recent poster, will protect our interest by providing "a low price and good support".

• No, our code is by no means simply a productized version of the work done by McGill University. Since their implementation of X11R4 for NeXTstep 1.0 is in the public domain, we did look at it to see what approach they took. We, however, chose to design co-Xist to run inside a NeXTstep window as opposed to the McGill approach of taking over the display with a hot-key toggle between the two environments.

co-Xist will also optionally include OSF/Motif 1.1 and the standard MIT X documentation in a form compatible with NeXT's Digital Librarian.

• Unlike McGill, we have had GREAT support from NeXT, and I can't emphasize this enough--NeXT support has been great and they get an enthusiastic THUMBS UP! Yes, we are aware of the religious issue of X versus NeXTstep and yes, we had to overcome some obstacles. We might as well go ahead and thank the two people most responsible for our success... Chris MacAskill and Scott Abel (both from NeXT). Again, thanks guys!!!

If you have any questions and/or comments please feel free to respond via e-mail or contact me at 512-343-1111.

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TOUCHTYPE

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Billed as a set of visually-oriented, intuitive tools for setting large size type, the program's features can be mastered in less than an hour by someone familiar with the NeXT environment. The two help windows, Basic Help and Power Help, are more than sufficient to accomplish straightforward typesetting tasks without recourse to any written documentation.

The heart of the available tools consists in a set of tool panels, including:

Font and Size Picker Panels: The font panel font size options range from 8 pts to 64 pts, and the font size picker ranges from 24 pts to 250 pts, permitting a maximum text size of 2-1/2 inches. A nice feature of both is their preview windows, illustrating what the selected font will look like before it is applied to the document.

Ruler Guides: These resizable, movable, horizontal and vertical rulers are often handy to drag into the middle of a document to measure the size of a piece of text, particularly for those of us who aren't used to thinking in "points". As an additional nicety, when zooming the edit window larger or smaller the ruler markings also zoom to the appropriate scale.

For the most part, anything that can be done using the tool panels can also be accomplished via the menu, which also has numerous additional features. The kerning submenu in particular offers more flexibility than the kerning tool panel, allowing the user to touch kern (i.e. adjust the spacing so that adjacent letters are touching), to save a particular kerning in a file for later use, and to automatically return to natural letter spacing if an effect didn't quite turn out as expected.

The Format submenu has options for aligning text lines, adjusting spacing between words, and rotating selected text by arbitrary degrees. Since the program makes it so simple to move text--individual letters can be removed from their place in a line merely by selecting and dragging--there is also a handy "back to baseline" option which will realign them. Be warned, however, that this option only produces the correct result when the letters are merely out of horizontal alignment: if you've been swapping them around, use Edit/Fix Selection to return them to their original positions.

To gain a variety of visual perspectives of the text, the Windows submenu offers incremental larger and smaller window zoom, a handy zoom back to default, and the extremely handy zoom

WYSIWYG (What You See Is What You Get), which zooms to an exact representation of printer output. It's much faster than the Previewer available from the Print submenu.

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TOUCHTYPE

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Finally, when you have finished playing with these features and have no clue how to fix the mess you have created onscreen short of global erase, the Edit submenu, in addition to the usual cut, copy and paste, incorporates bailout options. For localized disasters, Fix Selection will attempt to reconstruct a coherent version of the selected text, while Fix Everything rearranges the entire screen. The latter option may produce some rather bizarre results, but the program is kind enough to warn you of this fact and prompt for confirmation before proceeding.

And, by and large, it does a pretty good job of cleaning things up: I scattered the letters of a text line around on the page, rotating a copy of several of them and swapping the positions of several others, and it gathered up all of the original letters and put them back in their proper order, although rather than putting them in their original position it rearranged them onscreen starting wherever the first letter of the line happened to be.

Without a doubt, TouchType is simple to learn and to use and produces impressive printed results with a minimal amount of effort. But I found a certain awkwardness in the user interface, manifested not so much in a few monumental design blunders (there were really none of those) as in an accumulation of small annoyances, program features that invariably left me wondering, "Why did they do it THAT way?" A sampling of these features:

The curious behavior of windows

All of the tool panels except the ruler guides may be obscured by the editing window. This is a particular nuisance with the Tools panel, both because it is a very small and hence easily obscured window, and because changing cursors and moving text are frequently performed operations. The program might have taken the FrameMaker route and left the tool panels front as long as the application is active, so you can always find them easily. This might be a design judgment call: some people probably hate dragging panels out of their way when they need to edit. But, on the other hand, there are many circumstances, particularly in a format-intensive program such as TouchType, when mouse movement would be significantly minimized if the tool panel could overlay the active editing window.

The ruler guides, in contrast, are a little too forward. They stay front all of the time, even when another application is active. If, like me, you tend to have several applications open at once and bounce back and forth between them, this is a source of frustration, and I can't see any design justification for having to drag TouchType rulers out of the middle of, say, Digital Librarian.

Undoing justification

A necessary feature of any intuitive text processing program is the ability to easily undo any formatting experiments gone awry. For the most part, TouchType performs admirably in this respect: given a submenu with formatting options, the same submenu generally provides a mechanism for "unapplying" those formats. The Format/Text/Align Justified option does have a quirk, however. If a line of text contains more than one word, the program performs justification by increasing the spacing between words. If it contains a single word, justification is achieved by increasing the spacing between letters. The former may be undone merely by selecting a different justification option from the same submenu. Undoing the latter requires you to go to the Kerning submenu and select Natural Letter Spacing, not exactly an intuitively obvious operation.

Copying text

One way to make copies of selected text is to hold down the Alt key while dragging the mouse. Much to my dismay, I found the behavior of this feature to be somewhat erratic: sometimes the program would make copies, as it should, but other times it would merely move the text. Worse still, the original text looked as if it was still in its original position, only to disappear when I did a screen redraw or a printout. A subsequent chat with a TouchType representative revealed that this is an apparent bug. The workaround for it is to hold down the Alt key not only while dragging, but also while selecting the text.

Granted, even considered cumulatively, these minor inconveniences are not sufficient to render the program unusable. But with a relatively limited repetoire of features, a self-avowed focus on ease of use, and a $250 list price, one expects not to be inconvenienced at all.

MATHEMATICA TUTORIAL

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Help

One convenience of Mathematica is the *"Help"* option on the main menu at the upper left corner of the screen. If you select this, a submenu will pop up that includes an option for a quick explanation of the beep that occasionally signals that you have made an error. In addition, there is a help cursor. You can select this, and then move around the menu with the mouse until you find the desired option. Click the mouse, and a help window will arise for that option.

If you want to receive additional information on Mathematica, select the *"Info"* option from the main menu. This has a general help window, but also an option to create a registration form. Select this option to display the form, then fill it out, and print it. If you send it on in to Wolfram Research, Inc. they will send out the requested information.

Working in Mathematica

Enter expressions into Mathematica merely by typing them in. If your formula doesn't all fit on one line, you may continue on additional lines (just press "*Return*"). To actually start the evaluation of the expression, press the "*Return*" key while holding down the "*Shift*" key. You will use this "*Shift-Return*" key combination repeatedly throughout your session. A simple calculation is quite easy:

```
2 + 3/4        ←Type in the formula, then
                  press "Shift-Return"
```

You obtain:

In[1]:=

```
2 + 3/4
```

Out[1]

```
11
--
 4
```

You could also use symbolic expressions:

In[2]:=

```
(x+1) (x^2 + 2x y + 4y^2 -3)
```

Out[2]

$$(1 + x)\ (-3 + x^2 + 2\,x\,y + 4\,y^2)$$

Note that multiplication is indicated by juxtapositioning the components of the product, as in standard mathematical notation (or, optionally with "*"). Addition, subtraction, division, and powers are obtained with familiar symbols: "+" "-" "/" and "^." Standard mathematical constants, such as "π," "*i*," and "*e*" are built into Mathematica. Their names follow the rule: "*Standard system functions always begin with a capital letter for each word in the name -- even if they have only one letter names.*" Thus they may be obtained as: "**Pi**," "**I**," and "**E**." The functional form, "**Exp[]**," provides an alternative for "**E**." There is even a constant for ∞: "**Infinity**."

You can refer back to the previous expression with the abbreviation "*%*":

In[3]:=

```
Expand[%]
```

Out[3]

$$-3 - 3\,x + x^2 + x^3 + 2\,x\,y + 2\,x^2\,y + 4\,y^2 + 4\,x\,y^2$$

The expanded expression can also be separated back into its primary factors:

In[4]:=

```
Factor[%]
```

Out[4]

$$(1 + x)\ (-3 + x^2 + 2\,x\,y + 4\,y^2)$$

Expand and **Factor** are functions that modify the appearance of expressions. An entire series of related functions allows you to pick apart and reassemble formulas in whatever form seems most attractive. The percent signs always refers to your previous expression. Refer to the penultimate expression with "*%%*," or any particular formula appearing earlier in your session notebook by "*%n*," where "*n*" is the expression number that shows up on the

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"*In[#]:=*" prompt (its sequence number for the session). [1]

We can evaluate expression *#2* with *y* set to *5* as follows:

```
%2/.y->5
(1 + x) (97 + 10 x + x^2)
```

Further substitution of *2.22* for *x* gives:

```
%/.x->2.22
399.693448
```

Use of decimal numbers automatically induces numeric results. If, instead, you put in a rational form of the expression, you get exact results:

```
%%/.x->222/100
 49961681
------------
  125000
```

You can also force numeric evaluation by placing the expression within the "**N[]**" function or appending "**//N**" after the expression. For example:

```
123/456  +  321/654 //N
0.7605625301786576
```

Note that multiplication is indicated by juxtapositioning the components of the product, as in standard mathematical notation (or, optionally with "*"). Addition, subtraction, division, and powers are obtained with familiar symbols: "+" "-" "/" and "^." Standard mathematical constants, such as "π," "*i*," and "*e*" are built into Mathematica. Their names follow the rule: "*Standard system functions always begin with a capital letter for each word in the name -- even if they have only one letter names.*" Thus they may be obtained as: "**Pi**," "**I**," and "**E**." The functional form, "**Exp[]**," provides an alternative for "**E**." There is even a constant for ∞: "**Infinity**."

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```

Out[3]

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The expanded expression can also be separated back into its primary factors:

In[4]:=

```
Factor[%]
```

Out[4]

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Expand and **Factor** are functions that modify the appearance of expressions. An entire series of related functions allows you to pick apart and reassemble formulas in whatever form seems most attractive. The percent signs always refers to your previous expression. Refer to the penultimate expression with "*%%*," or any particular formula appearing earlier in your session notebook by "*%n*," where "*n*" is the expression number that shows up on the "*In[#]:=*" prompt (its sequence number for the session). [2]

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```
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 49961681
------------
  125000
```

(continued on page 19, column 1)

1. These prompts will be omitted henceforth in this handout.

2. These prompts will be omitted henceforth in this handout.

MATHEMATICA TUTORIAL

(continued from page 18, column 2)

You can also force numeric evaluation by placing the expression within the "**N[]**" function or appending "**//N**" after the expression. For example:

```
123/456  +  321/654 //N
0.7605625301786576
```

The numeric evaluation function ,"**N[]**," also offers a second argument to specify the precision:

```
N[Pi,50]
3.1415926535897932384626433
83279502884197169399375 1
```

The previous examples illustrated some other forms of Mathematica notation along the way. The appendage "**/.x->2.22**" specifies replacement of portions of an expression ("**/.**") according to a standard substitution rule. In this case, the rule "**x->2.22**" causes replacement of "*x*." Substitution rules of this sort frequently arise in other contexts in Mathematica as well. Functions with arguments illustrate another form of notation: "**[]**," where the arguments appear as a list inside brackets that follow the function's name.

You can also set values for variables, such as"*x*," or "*y*," with an assignment statement:

```
x=2.22; y=5
```
←*Notice that I put two statements on the same line separated by a semicolon.*

Now when you use these variables, there values are automatically substituted in:

```
(a + b x) (2x^2 + 3 x y +
4y^2 + 10)
153.1568(a + 2.22 b)
```

If you want to erase the value for a variable, to return it to symbolic use, assign it to "nothing" as represented with a period:

```
x=.; y=.; Expand[(a + b x)
(2x^2 + 3 x y + 4y^2 + 10)]
10a + 10b x + 2a x^2 + 2b x^3
+ 3a x y + 3b x^2 y + 4a y^2 +
4b x y^2
```

Multi-character names are permitted for variables, (eg. george=12). However, to avoid conflicts with built in Mathematica names, you should use lower case letters for the names (at the very least, use a lower case letter to start the name). Names, of course, must start with an alphabetic character (never a numeric digit).

Note: Since multi-character names are possible, you must always take care to separate distinct variables in expressions. Overlooking this requirement is a common error:

```
Factor[x^2 + 2xy + y^2]
```
← *Here the "x" and "y" are jammed together and treated as one variable, unrelated to "x" or "y."*

$x^2 + 2\,xy + y^2$

```
Factor[x^2 + 2x y + y^2]
```
← *This fixes the problem.*

$(x + y)^2$

Editing expressions the convenient way: with the mouse

The graphical interface provided by Mathematica offers particularly easy ways to edit your expressions. You can actually move the mouse up on top of an existing formula, click on it, and then edit the contents with ordinary keyboard commands. When you press "*Shift-Return*" after finishing your edits, the expression will be re-evaluated, and new output will replace the previous. If this occurs in the middle of the notebook, the output from later expressions will be saved, and shifted up or down as necessary.

Moving or copying expressions (or portions thereof) is also easy with the mouse. Slide the mouse to the start of the target text, press down the mouse button, and drag it across to the right. The selected text will be marked with gray. Once all of the desired text has been selected, lift the button. Click on the Edit menu, and then on its Copy option. Then mouse back down to the location where you want the copy inserted. Click the mouse to position yourself in this area. Then return to the Edit menu, and

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click the Paste option. Move the mouse back to the main window at the point inside the newly copied text that you wish to edit. Click there to bring up the text editing bar. Make your changes and press "*Shift-Return*" to evaluate the revised expression.

You can tear off a copy of the edit menu and move it over closer to your document if you wish. Just grab it by placing the mouse on its title bar, pressing down the mouse button, and dragging it to the new location. There are also keyboard shortcuts available for the common edit commands. These appear in green on the keys at the lower left, and operate in combination with the "*Command*" key, when it is pressed like a shift key:

Command-C: copy *Command-X*: cut *Command-V*: paste *Command-Z*: undo

Lists (vectors)

Lists of objects (numbers, variables, expressions, etc.) can be constructed and manipulated easily with Mathematica. These also form the basis for handling of vectors and matrices (described in more detail later in this handout). Lists are made by separating the members by commas, and enclosing them in braces (*ie.* {•,•,•,…}). The lists can then be included in expressions, producing new lists as output. For example:

```
{2,4,6,8}x^{2,3,5,7}
```

gives:

$\{2x^2, 4x^3, 6x^5, 8x^7\}$

or:

```
Expand[(1+zed){3, 2+3a,
4+9a+17a^2}]
```

yields:

$\{3 + 3zed, 2 + 3a + 2zed + 3a\ zed,$
$4 + 9a + 17a^2 + 4zed + 9a\ zed + 17a^2\ zed\}$

You can pick out individual elements of lists by using double brackets:

```
{a,b,c,d}[[2]]
b
```

Double brackets are used for indexing in order to distinguish from the specification of function arguments. There are the four main bracketing schemes in Mathematica:

(*expression*) ← parentheses group expressions to control calculations

Function[*arg*] ← brackets enclose arguments for functions

{•,•,•,…} ← braces enclose lists (vectors)

{•,•,•,…}[[*index*]] ← double brackets index into lists

Creating your own Functions

You can build functions in Mathematica from expressions involving existing functions quite easily. Sophisticated programming facilities, such as loops, if-then constructs, etc. are also available. Follow the same rules for function names as for variable names (in particular, start them with lower case letters). Assignment statements allow you to create functions. However, there are two types of assignment to choose from. Ordinary "=" as is used with variables, evaluates your expression immediately, and then puts it into the function. Delayed assignment (with ":=") stores the expression in the function and then evaluates it when the function is used. The delayed assignment is generally best approach for defining functions, for example:

```
esin[theta_] := Exp[theta]
Sin[theta]
```

creates a function that can be used with numeric or symbolic arguments:

```
esin[3Pi/2]
-E((3*Pi)/2)
esin[3.0012]
2.813982414021476
esin[a + 2b]
E(a + 2b)Sin[a + 2b]
```

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Look closely at the argument in the definition for "**esin**." Note the trailing underline. It causes the corresponding variable name, "*theta*," to treated as a formal argument to the function. This implies that the actual argument supplied to the function (*eg*. "**3Pi/2**") should be substituted into the original expression wherever "*theta*" appeared. The trailing underline is necessary. Omitting it undermines argument substitution.

Saving your work

Once you have created your functions, there are two ways of saving them. You can save your entire Mathematica notebook by selecting "*Save*" from the "*Window*" menu. Alternatively, you can issue a save command (eg. **Save["filename",esin,•,•,•,…]**) and later call the functions back into any notebook (not necessarily a continuation of your current session) with Mathematica's retrieve command: **<<filename**. When saving an entire notebook for the first time, assign it a name other than the default (*Untitled-1*). Do this by selecting "*Save as*" from the "Window" menu. A panel will pop up with a mini-directory-browser, allowing you to select the location, and then type in the name for your notebook. You can also save your work quickly at any time with the "*Command-s*" key combination. Recall the notebook with "*Window*" -- "*Open*."

Calculus

Mathematica knows enough about calculus to handle symbolic differentiation, integration, and limits. For example, to differentiate"*tan y/(e^x sin x)*," type in:

```
D[tan y/(E^x Sin[x]),x]
```

to get:

```
-(Tan[y] Cos[x])/(E^x Sin[x]^2) - Tan[y]/(E^x Sin[x])
```

Note: Make sure that you specify system functions correctly (not as mere variables):

```
D[sin x,x]
```

gives you:

```
sin
```

when you might really desire:

```
D[Sin[x],x]
```

to get:

```
Cos[x]
```

Taking second derivatives is equally easy:

```
D[Tan[y]/(E^x Sin[x]),{x,2}]
```

gives:

```
 2 Cos[x]^2 Tan[y]   2 Cos[x] Tan[y]    2 Tan[y]
---------------- + --------------- + ---------
   E^x Sin[x]^3        E^x Sin[x]^2     E^x Sin[x]
```

Derivatives with respect to both *x* and *y* just require one more argument (*y*):

```
D[Tan[y]/(E^x Sin[x]),x,y]
```

to get:

```
      -Cos[x]                    1
-----------------  -  ---------------
E^x Cos[y]^2 Sin[x]^2    E^x Cos[y]^2 Sin[x]
```

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Feasible indefinite integrals can also be obtained:

```
Integrate[Cos[theta] Sin[theta],theta]
```

provides:

```
-Cos[theta]^2
------------
      2
```

Explicit formulas for definite integrals can often be found:

```
Integrate[x Sin[x],{x,a,b}]
```

results in:

```
a Cos[a] - b Cos[b] - Sin[a] + Sin[b]
```

Occasionally these reduce to simple numeric expressions:

```
Integrate[z^10 Exp[-10z], {z,0,Infinity}]
567/15625000
```

The numeric form could have been chosen instead, either by first symbolically integrating:

```
Integrate[z^10 Exp[-10z], {z,0,Infinity}]//N
```

or directly with numerical methods (most useful when symbolic integrals don't exist):

```
NIntegrate[z^10 Exp[-10z], {z,0,Infinity}]
```

to obtain:

```
0.000036288
```

Power series approximations to functions can be carried to an arbitrary number of terms:

```
Series[Exp[x]Sin[x], {x,0,10}]
```

$$x + x^2 + \frac{x^3}{3} - \frac{x^5}{30} - \frac{x^6}{90} - \frac{x^7}{630} + \frac{x^9}{22680} + \frac{x^{10}}{113400} + O[x]11$$

Limits may also be obtained:

```
Limit[Sin[x]/x, x->0]
```

gives:

```
1
```

Solving equations

Mathematica can also solve equations:

```
Solve[a y^2 + b y + c == x, y]
{{y -> (-(b/a) + (b^2/a^2 - (4(c - x))/a)^(1/2))/2},
 {y -> (-(b/a) - (b^2/a^2 - (4(c - x))/a)^(1/2))/2}}
```

Even simultaneous equation sets can be handled:

```
Solve[{a x + b y == r,c x + d y == s},{x,y}]
{{x -> (d r)/(-(b c) + a d) - (b s)/(-(b c) + a d),
  y -> -((c r)/(-(b c) + a d)) + (a s)/(-(b c) + a d)}
```

While you can attempt much more taxing equation solving problems, these may yield huge amounts of output (too much to print here).

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Matrices

Mathematica allows you to construct matrices by nesting lists of lists:

```
mx = {{a,a^2},{a b,a^2 b}}
     {{a, a^2}, {a*b, a^2*b}}
```

←*Note that youcan press "*Return*" in the middle of an input line, to continue on the next line. That is why "*Shift-Return*" is needed to start it running.*

To display them in matrix format, use:

```
TableForm[mx]
```

$$\begin{matrix} a & a^2 \\ a\ b & a^2\ b \end{matrix}$$

More elegant matrix manipulations are also possible:

```
Eigenvalues[mx]
{a (1 + a b), 0}
```

or:

```
Inverse[{{ 2 x,  3 x^2,  5 x^3},
 { 7 x, 11 x^2, 13 x^3},
 {17 x, 19 x^2, 23 x^3}}]
```

$$\{\{ -1/(13x),\ -1/(3x),\ 8/(39x)\},$$
$$\{-10/(13x^2),\ 1/(2x^2),\ -3/(26x^2)\},$$
$$\{\ 9/(13x^3),\ -1/(6x^3),\ -1/(78x^3)\}\}$$

Extended output facilities

Equations, graphics, and other material can be organized into complex, structured notebooks inside of Mathematica. This exploits the hierarchy of cells described in detail in Wolfram's book. Ouput from Mathematica can also be cut (or copied) with mouse edits, and then pasted in to other applications, such as Write-now. However, Framemaker provides a clearly more powerful alternative for document development. This handout was produced by pasting Mathematica cell contents into Framemaker. Mathematica can also build suitable output files for typesetting with TEX to obtain truly gorgeous equations.

Graphing with Mathematica

You can produce graphs in Mathematica in much the same way that you would do anything else: by executing functions. Standardly available graphing functions include: **`Plot`** (for *X-Y* plots), **`ParametricPlot`**, **`Plot3D`**, **`ContourPlot`**, and **`DensityPlot`**. These plot parametric functions that you specify. If you wish to plot raw data values, another series of plot functions (with the same names prefixed by "**`List`**") offers that capability.

The following example shows how easy it is:

```
Plot[Sin[x],P{x,0,5}]
```

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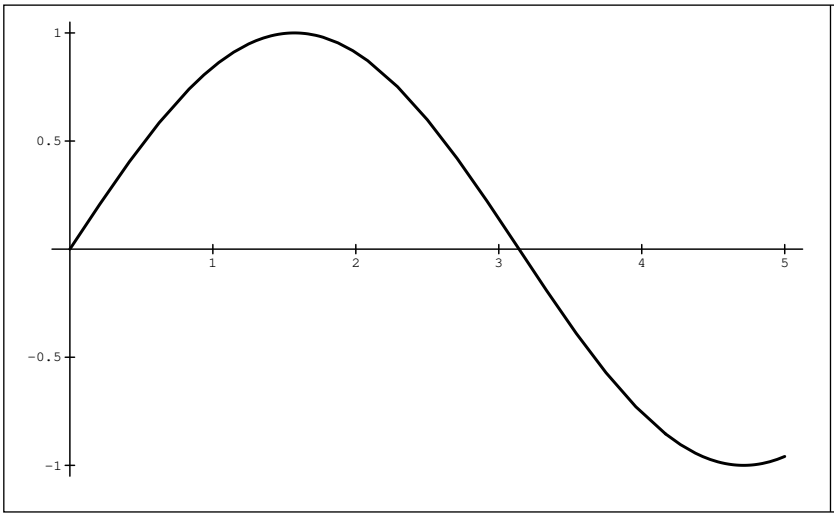
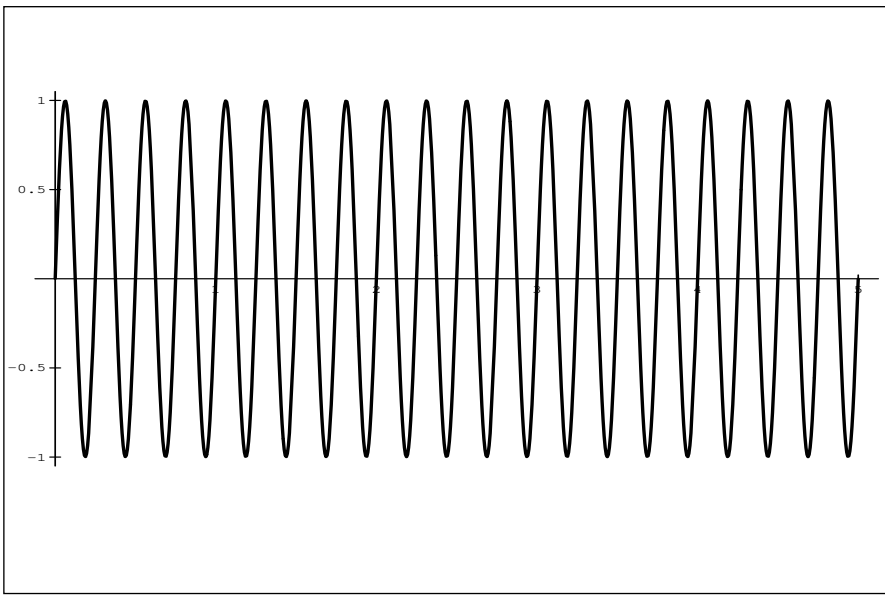


Note that "Plot" takes two arguments, the function to graph, and a list specifying the X axis range for the chosen function. The list includes the X axis variable name followed by the lowest and highest values to plot. As always, the list must be enclosed in braces.

On the NeXT, modifying the plot is quite easy as well:

```
Plot[Sin[8 Pi x], {x,0,5}]
```



Merely use the mouse to move the cursor to the spot in the original input line where you wish to make changes. Then click it, and type in the changes (here adding "8 Pi " in the argument to Sin, to create more waves). Press Shift-Return to rerun the plot.

Making a copy of the plot request is equally easy:
Mouse up to the start of line used for the previous plot request, press down the mouse button, and drag it across to the right. The selected text will be marked with gray. Once all of the desired text has been selected, lift the button. Click on the Edit menu, and then on its Copy option. Then mouse back down to the empty page area below your existing graphics output. Click the mouse to position

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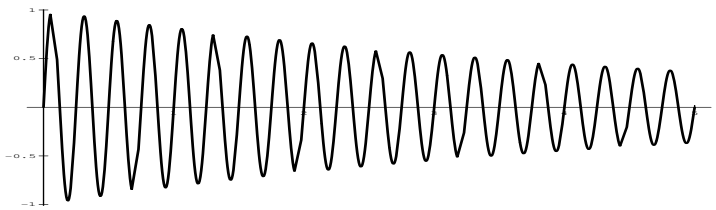
yourself in this area. Then return to the Edit menu, and click the Paste option. Move the mouse back to the main window at the point inside the newly copied text that you wish to edit. Click there to bring up the text editing bar.

Make your changes and press Shift-Return to run the new plot request:

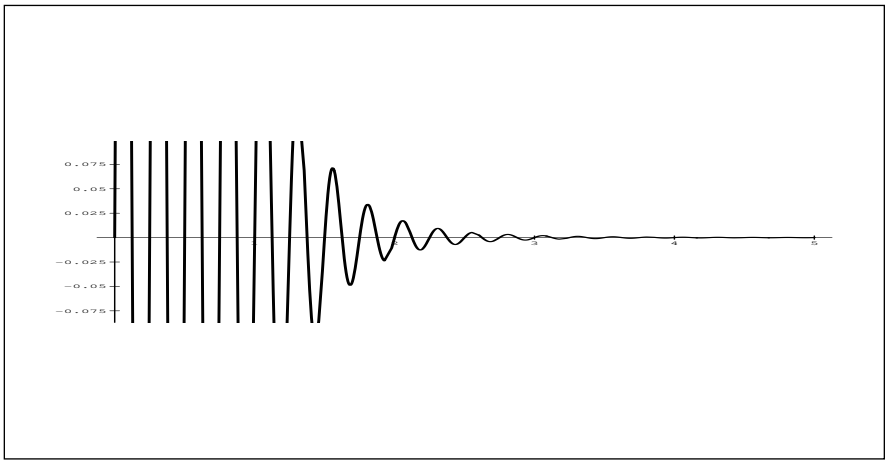
```
Plot[ Exp[-x/5] Sin[8 Pi x], {x, 0, 5}]
```



If you wish, you may use the keyboard as a shortcut for cut/paste. Pressing down the "Command" key and tapping the "C" key does a copy request. Command-V then pastes the material back in. Command-X can be used to move, rather than copy text. If you prefer to have the Edit menu close at hand, you can drag a copy by its title bar to wherever you need it.

Often, placing complex expressions inside the plot request seems cumbersome. You can avoid this by defining the expression as a function (with delayed assignment ":="), and then using this function in the plot request:

```
damped[x_] := [ Exp[-x/5] Sin[8 Pi x], {x, 0, 5}]
Plot[damped[x], {x, 0, 5}
```



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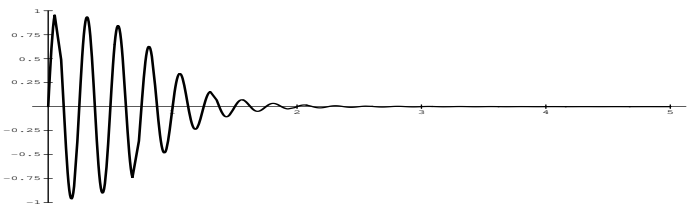
Mouse-based cut & paste editing is quite convenient when you are developing formulas or plot requests. It gives you greater flexibility than the use of "%" for previous expression, "%%" for penultimate expression, and "%n" for the nth expression of the session. You may copy portions of aline just as easily as entire lines. You can even copy the material into other applications (such as Write-Now) by pasting into an open window for that application. You can easily add material to a formula by just mousing over to the desired spot, clicking, and typing. Doing this to the previous plot in order to explicitly control the range for plotting on the y-axis improves upon the previous plot:

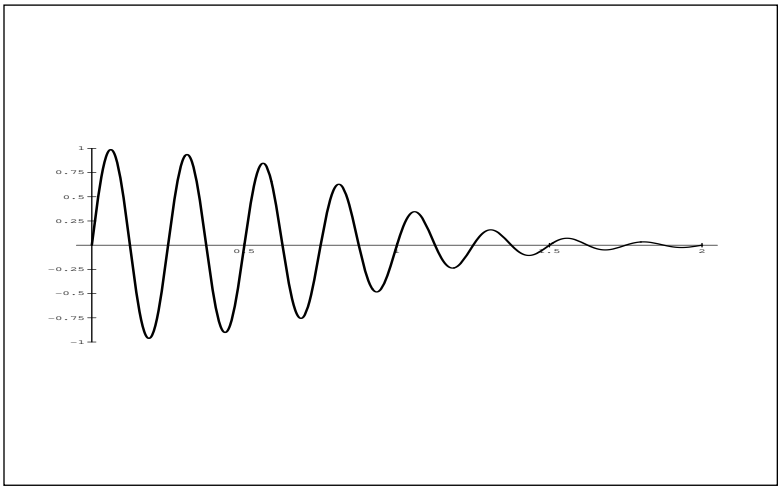
```
Plot[ damped[x], {x, 0, 5}, PlotRange->{-1, 1}]
```



Plot has quite a variety of optional arguments, eg. PlotRange, which manually sets the Y-axis range. These are listed out after the function, and X-axis specifications before the closing bracket. They exploit the substitution operator "->" to assign the new values, using a list {,,...} whenever more than one value must be set.

Further modification of the X-axis range helps even more:

```
Plot[ damped[x], {x, 0, 2}, PlotRange->{-1, 1}]
```



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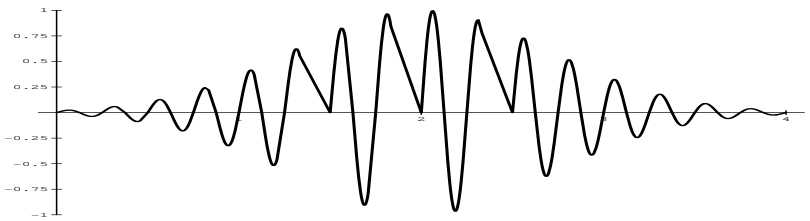
The next few experiments use a different envelope for the sine wave:

```
bellsin[x_] := Exp[-(x-2)^2] Sin[8 Pi x]
Plot[bellsin[x], {x, 0, 4}, PlotRange->{-1, 1}]
```

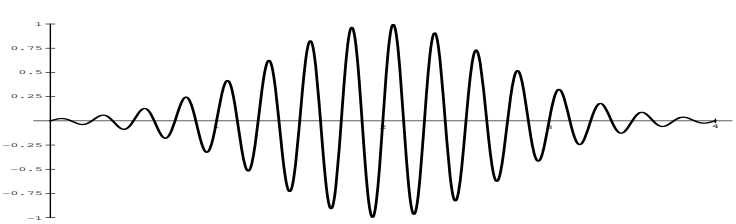


Note that plot seems to have blown it in three places, where it cut off at zero rather than finding the proper nadirs. More plot points are needed for such a finely detailed function.

```
Plot[bellsin[x], {x, 0, 4}, PlotRange->{-1, 1}, Plotpoints->100]
```

General::unkopt: Option Plotpoints->100 is not known for Plot.	I tried to specify this, but made one of my most frequent errors: It wants "PlotPoints," not "Plotpoints."

```
Plot[bellsin[x], {x, 0, 4}, PlotRange->{-1, 1}, PlotPoints->100]
```



Fortunately, this can be quickly corrected with mouse editing.

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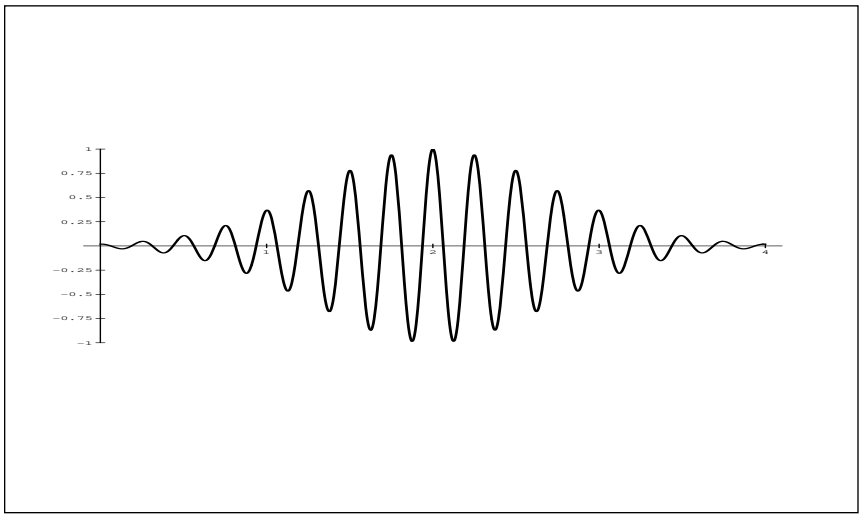
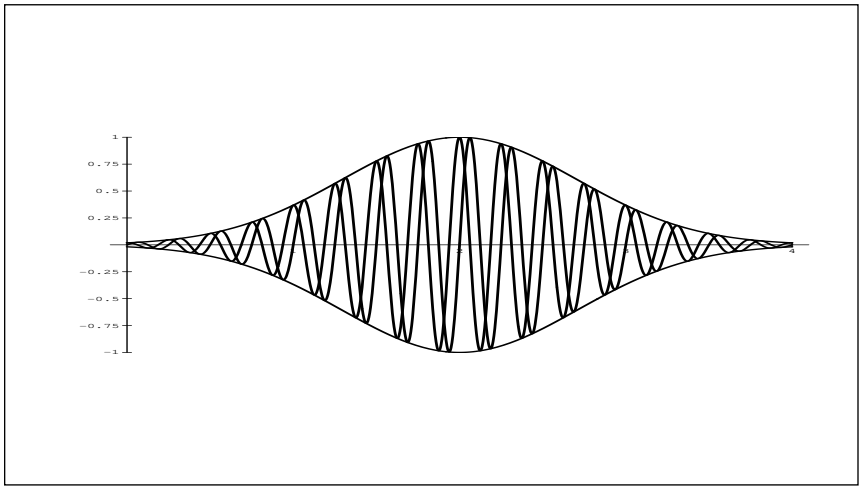
A corresponding curve using the cosine can then be constructed by copy, paste, and changing "sin" to "cos" in a couple of places:

```
bellcos[x_] := Exp[-(x-2)^2 Cos [8 Pi x]
Plot[bellcos[x], {x, 0, 4}, PlotRange->{-1, 1}, PlotPoints->100]
```



Now for the fancy tricks. You can actually give Mathematica a list of functions to plot as the first argument and get them all overlaid on a single plot. In this case, I included four functions in the list, the recently defined bellsin, bellcos, plus the normal density envelope, and its vertical reflection:

```
Plot[bellsin[x],bellcos[x],Exp[-(x-2)^2],-Exp[-(x-2)^2]},
{x,0,4}, PlotRange->{-1, 1}, PlotPoints->100]
```



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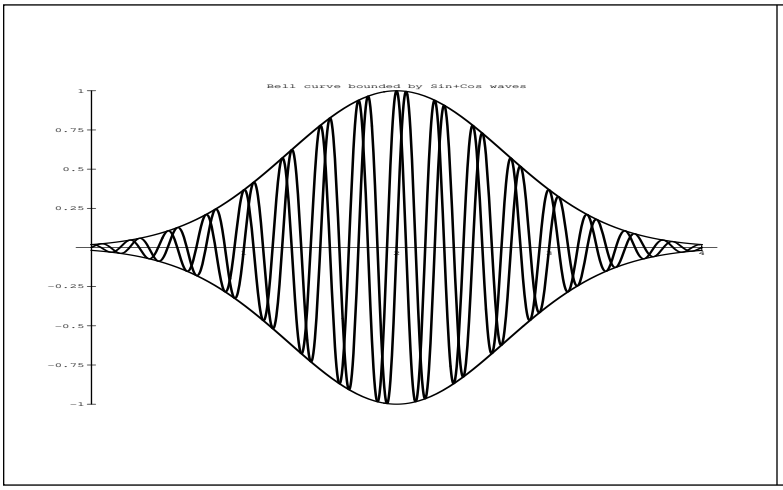
Until now, all of the plots have come out in the standard size set by Mathematica. You can alter the size of a plot dynamically by clicking the mouse inside the plotted area. A box pops up around the plot with little square blocks that serve as handles. Mouse over to a convenient handle (often at the lower right), and press down the mouse button. While holding it down, drag the box out to the desired size. When you release the button, the graph will disappear temporarily, before it re-appears in its rescaled form:

In[9]:=

```
Plot[bellsin[x],bellcos[x],Exp[-(x-2)^2],-Exp[-(x-2)^2]},
{x,0,4}, PlotRange->{-1, 1}, PlotPoints->100], AspectRatio->1,
PlotLabel->"Bell curve bounded Sin+Cos waves"]
```



Two additional plot options were included here, adjusting the aspect ratio of the plot (making it square), and adding a title.

Mathematica also does three dimensional plots. The function then depends upon two variables, (here "x," and "y"), and thus has two range specification lists ({x,0,4} and {y,0,4}), appearing as the second and third arguments to Plot3D:

In[9]:=

```
bellsin2[x_] := Exp[-(x-2_^2] Sin[2 Pi x]
```

In[15] :=

```
Plot3D[bellsin2[x],bellsin2[y], {x,0,4},{y,0,4},
PlotRange->{-1, 1}, PlotPoints->100]
```

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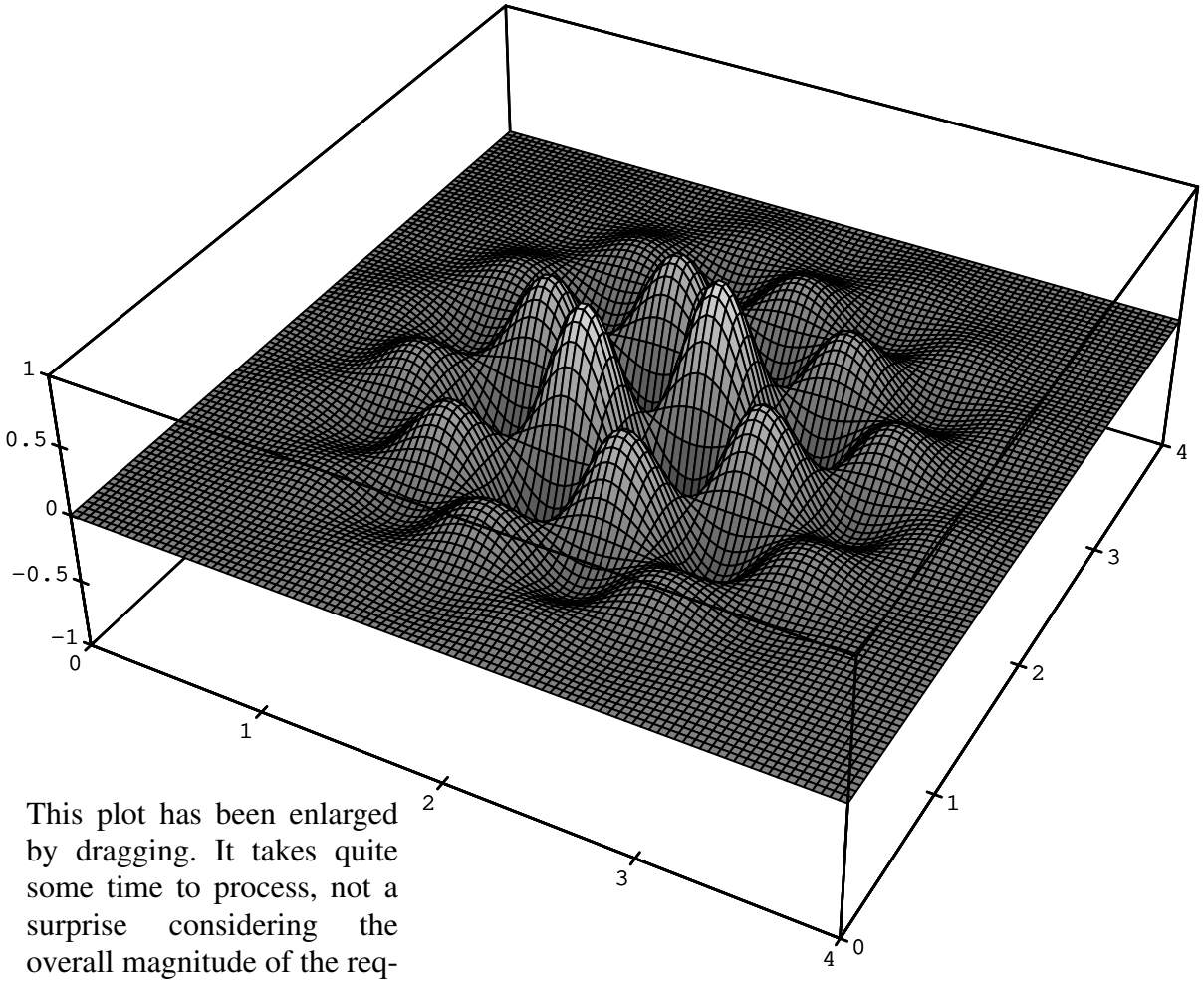

This plot has been enlarged by dragging. It takes quite some time to process, not a surprise considering the overall magnitude of the requisite computations.

The Show function allows you to easily replay plots with modifications to the plotting parameters. The selected options change the appearance of the plot quite substantially. If you don't like Mathematica's default lighting, you can specify the light sources as well. Here "%" refers to the previous plot:

In[16]:=

```
Show[%, Lighting->True, Mesh->False, Boxed->False]
```

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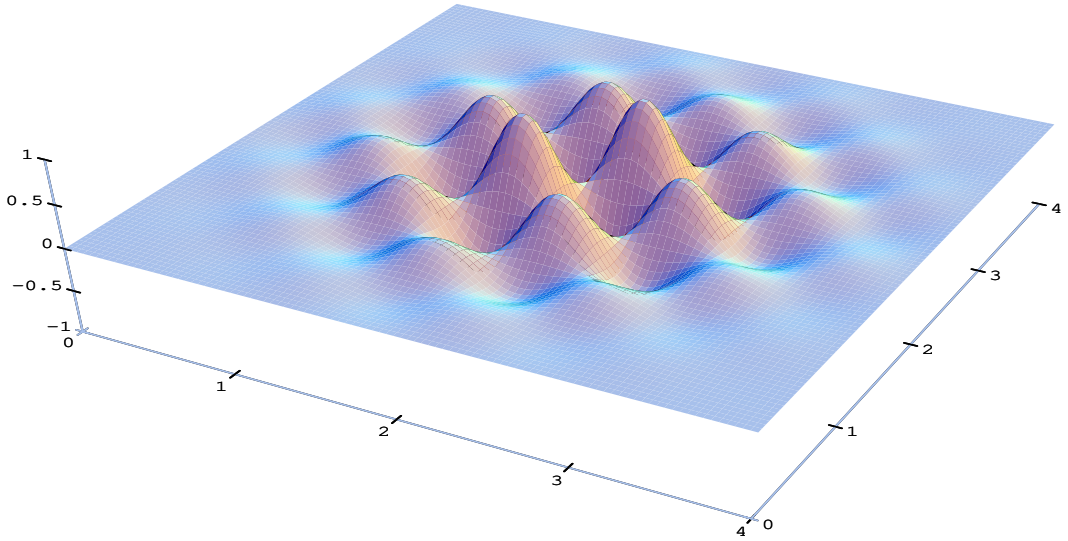
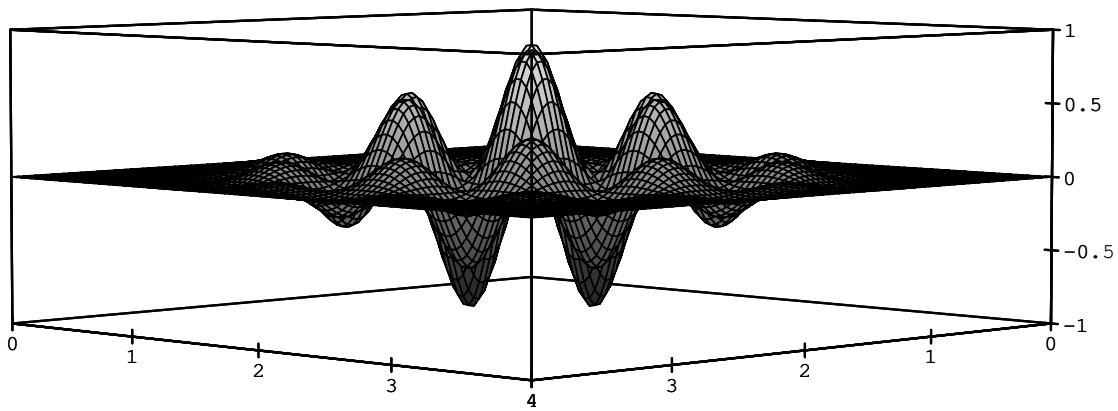


The last example in this series replots the image from the previous page again, with the original surface characteristics, but from a different viewing position:

In[17]:=

```
Show[%%, ViewPoint->{5,5,0.5}]
```



In this case, "%%" refers back to the plot before the one above - "%15" could have been used instead.

NeXT PRODUCTS

The following is a partial listing of products for the NeXT. This is not an official publication of NeXT Computers, Inc. and no warranty, either express or implied, is given. Up-to-date info is always welcome. Copies for review are encouraged. Reply to Chuck Herrick, cnh5730@calvin.tamu.edu.

ANALYTICAL

Affinity Systems (316.636.5100):
Tactician Plus (multiuser spreadsheet)
Ashton-Tate (800.437.4329):
PowerStep (spreadsheet)
Informix (913.599.7100):
INFORMIX-TURBO (database engine for OLTP)
Wingz (spreadsheet)
Ingres (800.446.4737):
RDBMS (database)
KnowledgeSet Corp (415.968.9888):
KRS (database search and retrieval)
Lotus (617.577.8500):
Improv (spreadsheet)
Microstat (604.228.1612):
OMEN III (investment information retrieval and manipulation)
Oracle (800.345.3267):
RDBMS (database)
Professional Software (617.246.2425):
Objective DB Toolkit (30 classes link NeXT to Sybase)
SAS (919.677.8000):
statistical analysis and presentation software
Stone Design (505.345.4800):
DataPhile (database)
Sybase (800.879.2273):
SQL Server (database)
Triakis (505.672.3180):
DAN (data analysis and plot system)
Wolfram Research (217.398.0700):
Mathematica (mathematical analysis)

PUBLISHING

Abaton (800.444.5321):
Scan 300/GS (scanner)
Adobe (415.961.4400):
Illustrator, *Plus Pack*, *SmartArt*
Altsys (214.680.2060):
Stealth (advanced drawing, graphic arts)
Canon (800.848.4123):
IX-30F Image Scanner (scanner)
Data Transforms (303.832.1501):
InDia (graphical decision-making)
GEMS (flexible modeling system, ex: economics)
Epitome(615.675.0910):
Redline (multiple reviewer)
Flash Graphics (415.331.7700):
Flash Graphics (screen, slide, paper presentations)
Font Company (602.998.9711):
extensive PostScript font library
Frame Technology (408.433.3311):
FrameMaker (desktop publishing environment)
HSD (415.964.1400):
Scan-X (scanners, optical character recognition software)
Innovated Data Design (415.680.6818):
Dreams (drawing and drafting)
Lighthouse Design (800.366.2279):
Diagram (graphical diagramming)
Media Logic (213.453.7744)
Artisan (paint and image processing system)
TopDraw (drawing package)
Quark (303.934.2211):
QuarkXPress (publishing software)

RightBrain Software (415.851.1785):
TouchType (typesetting; desktop publishing)
Stone Design (505.345.4800):
Create, *ArtDraw*, *TextArt* (desktop publishing)
T/Maker (we need a phone and address):
ClickArt (PostScript images library)
WordPerfect (801.225.5000):
WordPerfect 5.0 (word processor)

CONNECTIVITY

Abaton (415.683.2870):
InterFaxNX (fax modem)
Active Ingredients (617.576.2000):
Communicae (VT220 and Tektronix 4010/4014 emulation)
Asante (408.734.4844):
TR/SC (NeXT (SCSI) to Token-Ring)
Atlantix (800.262.6526):
XWave (integration software, NeXT to PC LANs)
AVATAR (508.435.3000):
InSession 3270 (IBM 3270 connectivity)
Cayman Systems (617.494.1999):
GatorBox, *GatorMail*, *GatorShare* (NexT to Mac net)
Coconut Computing (La Jolla, CA; brian@coconut.com):
COCONET (Unix-based BBS/ conferencing program)
Conextions (508.475.5411):
3270Vision (IBM 3270 connectivity)
DataViz (203.268.0030):
MacLinkPlus/PC (NeXT to Mac file transfers)
HSD (415.964.1400):
OCR (fax software-scanner)
Morning Star Technologies (800.451.1883):
Synchronous SCSI Communication Interface
Novell (408.434.2300):
Novell NetWare integration software

Objective Software Engineering (604.261.0186):
Mirage Fax (fax modem)
Software Ventures (415.644.3232):
MicroPhoneII, *WatchMe*, *ScriptEditor* (telecommunications)
Touch Communications (408.374.2500):
Worldtalk/400 (X.400 messaging gateways)
Transarc (412.338.4400):
AFS (distributed file system)

COLOR

Analytical Graphics (215.337.3055):
STK (Satellite Tool Kit, satellite planning)
HSD (415.964.1400):
Scan-X Color (color scanner)
Tektronix (503.221.1063):
Phaser PX (color printer, serial, parallel and AppleTalk ports)
Oce (800.545.5445):
OceColor (PostScript printer)
QMS (415.363.4300):
ColorScript 100 (color PostScript printers)

GRAPHICS

Pencom Software (512.343.1111):
X windows X11R4
Ohio Supercomputer Center (614.292.0006, michelle@osgp.osc.edu):
apE (visualization and image processing package)

SOUND

Univ. Virginia (uvaarpa.acc.virginia.edu):
CSound-NeXT v2.0 (digital synthesis software interface)

MULTIMEDIA

Ariel (201.249.2900):
IRCAM (multi-RISC NeXTBus board for vector/signal processing engine)
Boss Logic (515.472.7740):
Boss BDMS (document management software)
Coda Music Software (800.843.2066):
MusicProse (music notation software)
DisCopyLabs (415.651.5100):
software duplication services in 2.88 MB format
Icarus Software (617.247.1350):
LiNK-IT (hypertext system)
Imagine, Inc (313.487.7117):
MediaStation, *MediaBrowser* (multimedia database)
FirstChair (MIDI and sound sequencer)
Knowledge Transfer Intl (214.233.7693):
SimuLEARN (instructional multimedia tool kit)
Metaresearch (503.238.5728):
Color Digital Eye (high-res. color frame grabber)
Digital Eye, *Digital Ears* (gray-scale frame, sound grabber)
NVT (415.285.8744):
High Density Video Drive (video playback device)
Thoughtful Software (303.221.4596):
HyperCube (hypermedia environment)
Visus (412.687.3800):
Fax DEMON, *PaperSight* (fax, document image management system)

HARDWARE

Ariel (201.249.2900):
QuintProcessor (multiprocessor DSP NeXTBus board)
DM-N Digital Microphone
Daewoo Telecom (508.836.4800):
Daewoo Graphics & Imaging System (image processing board)
Dazzl (309.674.9317):
16/12 Analog to Digital Converter (NeXTBus board)
DIT (505.662.1459):
CubeFloppy 2.9 (floppy, Mac file transfer software)
CubeDigital I/O, SCSI488/N (NeXTBus boards, controllers)
Extron Electronics (800.633.9876):
Extron Board (NeXTBus large screen projector board)
IOtech (216.439.4091):
ADC488, DAC488 (A to D, D to A converters)
Digital488/80, Serial488/4 (IEEE to digital, IEEE to serial)
Driver488/N (IEEE488 Obj-C driver)
Pacific Microlectronics (800.628.3475):
PMHIDE (external SCSI hard disk drive enclosure)
Pers. Comp. Periph (813.884.3092):
JETSTREAM Tape Backup (high-performance tape backup)
PLI (800.288.8754):
SuperFloppy 2.8, Mach One (floppy, high-speed hard disk drives)
Singular Solutions (818.792.9567):
A/D64X (analog-digital interface)

BUSINESS

Adamation (415.452.5252):
Live Wire, *Who's Calling* (business info management)
Boss Logic (515.472.7740):
Contact! 1.0 (business contact database)
Chadwyck Healey (800.752.0515):
MundoCart/Optical (cartographic map database)
DIT (505.662.1459):
OnDuty (office task management)

Stained Glass Software (408.249.3337):
Calendoscope (appointment calendar program)
TransGraphics Systems (415.283.5750):
TransManager (terminal management software)

PROGRAMMING LANGUAGES

Absoft (313.853.0050):
FORTRAN77 (with object oriented extensions)
Acucobol (619.271.7097):
ACUCOBOL-85 (COBOL)
ana-systems (415.341.1768):
Modula-2
Franz Inc (415.548.3600):
AllegroCL (Common Lisp)
GNU (prep.ai.mit.edu):
C, *C++*, *Objective-C*, *Smalltalk*
Interactive Software Engineering (Santa Barbara, CA; eiffel.com):
Eiffel
Iverson Software Inc (416.925.6096):
J
Jefferson Software (602.234.3106):
Modula-2
Motorola (512.891.2030):
DSP 56000 Assembler
Oasys (617.890.7889):
C, *FORTRAN*, *Pascal*
Plus Five Computer Services (314.426.3900):
MUMPS
public domain:
FORTRAN-to-C converter (f2c.tar.Z in /pub/next/sources at cs.orst.edu)
Pascal-to-C converter (csvax.cs.caltech.edu in pub/p2c-1.18.tar.Z)
Prolog, *forth* (in development)
Standard ML (in pub/ml at princeton.edu)
Toltec Human Services (405.840.4254):
UNIX MUMPS
Univ. Va (804.982.2209):
Uvapc (Pascal)

DEVELOPMENT

Adobe Systems (415.961.4400):
Displaytalk (PostScript development environment)
Ariel (201.249.2900):
Bug-56 (DSP debugger)
ana-systems (415.341.1768):
Documenter's Workbench (troff, etc.)
By Design Technology (800.776.8649; email: info@bydesign.com):
OO-Browser (multi-language object-oriented class browser)
Information & Communications (800.776.9966):
AKGH (context-sensitive on-line help tool)
Lighthouse Design (800.366.2279):
Exploder (object-oriented database)
Schematic Entry (EE-CAD tool)
Motorola (512.891.2030):
SIM56000 (DSP simulator program)
Objective Technologies (212.227.6767):
[OT Palettes 1.0] (GUI object library/ palette)
ONyX Systems (817.468.2695):
BugByte (graphic interactive symbolic debugger)
Professional Software (617.246.2425):
Objective DB Toolkit (obj. library, database support)
Informix (913.599.7100):
Math++ (C-language math library)
WeDesign Inc (415.479.1105):
TheLibrary (on-line help information system)

MEDICAL

BioMedical Design Group (612.645.9062):
BioTRACE 8 (real-time acquisition and monitoring for animal research)

LMER (717.531.7589):
Gray's Anatomy-digital (digital version of Gray's Anatomy)

Toltec Human Services (405.840.4254):
Transcriber (medical record transcription tool)

OTHER

Alva Computer (804.851.6830):
Airfoil Design Kit (aerodynamic engineering tool)
Deltos Fleet Computing (214.540.2301):
GeoKit (object-toolkit for cartographic map rendering)
Halchin and Fleming (217.348.0917):
Rubik Algebra (courseware)
Spring (differential equation modeling program)
Taylor (Taylor polynomial software)
Insignia Solutions (408.522.7600):
SoftPC (IBM-PC/AT MS-DOS emulator)
LaSTLock (408.296.6550)
cable security system
Lighthouse Design (800.366.279):
First Compilation Disk (asst public domain software)
NeXTConnection (800.800.6398)
(NeXT-specific mail order)
public domain:
iwf (ImageWriter II printer-driver) (cs.orst.edu)
JumpBack (backup facility) (sonata.cc.purdue.edu)
News (NeXTstep newsgroup news-reader) (cs.orst.edu)
shareware:
iwscript (ImageWriter II printer-driver) (sutro.sfsu.edu)
Stuart (full-featured NeXTstep VT100 terminal app) (cs.orst.edu)
Software Engineering Solutions (512.343.2828):
AtTheBeep (NeXTstep message handling system)
Uni-Kit (415.490.8911)
cable security system

MAGAZINES AND NEWSLETTERS

BIX (800.227.2983):
NeXT special interest group
Boylan Enterprises (404.271.8305):
NeXUS Magazine: (NeXT oriented magazine)
Baran's Tech Letter (208.265.5286, nbaran@well.sf.ca.us) (newsletter)
International Data Group (415.978.3182):
NeXTWORLD (magazine)
NeXT on Campus (subscribemail: next_on_campus@next.com)
NeXT Users' Journal (elec. magazine; in /pub/next/buzzings at cs.orst.edu)
Tao (newsletter, in /pub/next/tao at nova.cc.purdue.edu)

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