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Free Objective-C Compiler

by Nick Christopher

As a developer on the NeXT and an advocate, Objective-C has always been somewhat of a mixed blessing. I hold with the belief that Objective-C is a far better development language then C or C++. It offers the simplicity of C with true object oriented capabilities. The down side is that only NeXT and Stepstone offer it. NeXT is already branded as too proprietary and Stepstone is very expensive and even less financially secure than NeXT. Its hard to evangelize a language that is almost unavailable.

Things have begun to change. NeXT's Objective-C, along with several other tools, is based on a product from the Free Software Foundation, Inc (FSF). The FSF (known for its product moniker GNU) has long produced good quality Unix software distributed for only the cost of the media. NeXT took its Objective-C enhancements to the GNU C compiler (gcc) and gave them to the FSF. And the FSF incorporated them into gcc 2.0. What this means is that any platform that can run gcc, (about 100+ machines I would guess) now have access to a free Objective-C compiler. I said that this is only the beginning of the change because a runtime library which provides everything from the basic Object class clear through the Appkit is not yet publicly available. I have heard rumblings that one is in the works, and I have to believe that its only a matter of time.

Since I felt that the advent of a free Objective-C compiler was very important, as soon as I heard that gcc now had Objective-C rolled into it I would get a copy and test it out. This was not a decision to make lightly based on my passed experience with GNU products. The tend to be multiple megabyte compressed tar files, they are interdependent (you need the FSF's version of YACC called bison to get gcc to compile for example) and they are usually fairly tricky to compile. But I had a mission.

Getting GCC

The site I was working at when gcc 2.0 was made available had a already received a version of the four plus megabyte copy of the source. That saved me a fair amount of effort. They also had the newest bison so that too was not a problem. So I was faced with the ugly task of building the compiler. In the past I had spent entire days of tinkering to get previous versions of the FSF's C++ compiler to work on a SUN. Well C++ is rolled into gcc now and that was all behind me I hoped.

Surprisingly enough the installation procedure was straight forward. Configuring the compiler for the NeXT was a simple one line command. The entire compilation procedure, which did involve over an hour, worked without a hitch from start to finish and the resulting compiler worked! However, the effort was not without its problems. It turns out that gcc 2.0 has two bugs on the NeXT, it whines about #import, and can't link to NeXT cc compiled objects. Luckily patches for both the bugs are available and when applied the compiler can be used as a direct replacement for the standard NeXT compiler.

To be thorough, I had gcc compile the GNU C++ runtime library (libg++). You see NeXT has a C++ compiler in their Developer Edition but it lacks a runtime library. If you want to use C++ to its full extent you need the runtime library. I have clients who use C++ so I thought that I should try gcc out on this. Well it appeared I found another bug in gcc 2.0. Compiling the newest libg++ on the NeXT generated some strange errors.

Well I was told that in fact I should use gcc 2.1, I was a version out of sync, with one additional patch. I got the patches that advance gcc 20 to gcc 2.1 and the additional patch and applied them all and then recompiled gcc. Without any problems gcc 2.1 was born and this time the newest version of libg++ compile with only a couple of problems.[1] While there were a few hitches I was really impressed with the simplicity of creating the new versions of gcc. The fact that a top quality compiler is free and was far easier to create and install than many commercial packages is a real testament to the hard work of the FSF, and as of this article I will be joining the League for Programming Freedom[2] an organization recommend by the FSF as being dedicated to making sure that efforts like their own can continue in this, the age of software patents and look-and-feel lawsuits.

The Real Test NeXT cc v. GNU gcc

First let my say that in some sense this is a bit of a mute test since NeXT's cc is basically a modified gcc 1.36. But nevertheless, here is what I found in a very limited testing. The times below represent an average of a couple of runs, in random order testing.

First I tried compiling a smallish application I wrote.

		make debug	make
Compile Time (sec)	cc	28.3	24.3
	gcc 2.1	32.1	29.9
Size of Result (kb)	cc	447894	447666
	gcc 2.1	450311	450737

Consequently gcc 2.1 was sightly less efficient but not by much. Next, I compiled a fairly CPU intensive compression program with both compilers. I turned on as much optimization as I could for each. Once I had a resultant program, I compressed a 4.3 meg file.

Size of Program(kb)	cc	16364
	gcc 2.1	16384
Compression Time (sec)	cc	90.2
	gcc 2.1	87.8

As a result the programs were of the same size but gcc 2.1 produced a bit faster program.

So gcc 2.1 Works But Should You Switch?

I did. The statistics above might not merit the change but I considered other things when I decided to start doing my work with gcc 2.1. First, I use it because it is a newer version of gcc than NeXT's cc and so it can compile the newer versions of other FSF products (i.e. NeXT's cc could not have compiled libg++ 2.0). The second reason I switched to it because of what it represents. Objective-C needs a free compiler and I want to take an active role in moving towards that goal. I can't say that I would push non-serious NeXT developers to switch though. Its a fair amount of work and resources for something that does not represent a real improvement.

[1] libg++ had a few function definitions that disagreed with the NeXT, mostly to do with sockets and also the library tried to replace strtol() with its own version - NeXT's don't take kindly to having their system functions replaced.

[2] For information about the League for Programming Freedom write:

League for Programming Freedom
1 Kendall Square #143
P.O.Box 9171
Cambridge, Massachusetts 02139

NeXT IN THE NEWS

by Eric Rosenthal

Gary Walker, Why the Choice Must Be C++, *C++ Journal*, 1992, no. 1, pp. 52-61, 63-65. One company chose C++ as its object-oriented programming language because its status as a de facto standard will bring better development environments, tools, training, and support. Six other languages with commercial support were also evaluated. Objective-C was criticized because weak static type checking makes many errors hard to find, performance may not be adequate for real-time applications, and few vendors support it. However, it was called "fairly successful" for applications involving a graphical user interface.

Inside Lines, *Computerworld*, March 30, 1992, p. 114. After hearing a voice-mail message from H. Ross Perot during a NextStep demo, Steve Jobs told an audience "He'd be a really awesome president."

InterActive Author for Next workstations (item in Pipeline), *InfoWorld*, March 30, 1992, p. 18. Imagine Multimedia Inc.'s multimedia authoring software.

NeXT names president, COO (item in Business Briefs), *MacWEEK*, March 30, 1992, p. 24. NeXT Computer Inc. names Peter van Cuylenburg president, chief operating officer, and board member.

Jean-Louis Gassée, Open systems that are open for business, *MacWEEK*, March 30, 1992, p. 27. Microsoft says MS-DOS and Windows are more open than Unix, and when Windows NT is POSIX-compliant it will be compatible with Unix. "NeXT Computer Inc. calls NT a 'Unix wannabe' and says it delivers the kind of NT goods today. But, while Chairman Steve Jobs can fight it off with Chairman Bill on rhetoric, there is the nagging installed-base question."

Cara A. Cunningham, Unix Standards Ease ISVs' Burden, *PC Week*, March 30, 1992, pp. 61, 73. Lists NeXT Inc. among companies planning new versions of system software in 1992.

Christopher Stetson, Still Complex, Unix Puts on a Prettier Face, *PC Week*, March 30, 1992, p. 105. NeXT Computer Inc. is the only major UNIX workstation vendor not using an interface based on X Windows. When Jobs decided to combine the ease of use of the Macintosh with the power of Unix, X Windows was still a research project.

Unix Graphical Workstations, *PC Week*, March 30, 1992, pp. 108, 110. Product directory includes NeXT.

Workstation Warriors Square Off, *UniNews*, March 30, 1992, p. 3. Next and Sun Microsystems are targeting each other. Next compared the two development environments in its videotape *Next vs. Sun: A World of Difference* and in the Booz-Allen & Hamilton survey it commissioned. A Sun presentation attacking Next's financing and Jobs triggered a detailed rebuttal from Next.

Robert Pool, Software for solving equations, *Science*, April 3, 1992, p. 55. NeXT's chief scientist, Richard Crandall, believes symbolic mathematical software can give more than number-crunching programs.

OnDuty provides productivity tools for Next computers (item in Pipeline), *InfoWorld*, April 6, 1992, p. 24. Digital Instrumentation Technology Inc.'s OnDuty 1.0 is shipping.

Gary M. Bradfield, If it acts like a NeXT, then it must be a NeXT (letter), *MacWEEK*, April 6, 1992, p. 44. The descriptions of future Taligent and Microsoft products sound like NeXTstep, which is already available. "If poeple want an operating system like a NeXT, an imaging system like a NeXT and a development system like a NeXT, maybe they should be aware that there is a NeXT."

Mac the Knife, That'll work (item in Phone-in-the-Mac potential), *MacWEEK*, April 6, 1992, p. 118. Apple is developing a new Macintosh help system with NeXT-like windows.

Robert X. Cringely, Stick to PCs, Mikey (item in Notes From the Field), *InfoWorld*, April 13, 1992, p. 110. Dell's NeXT PC will ship this summer when NextStep 3.0 is available.

Solaris goes after volume sales with Intel version, *InfoWorld*, April 20, 1992, p. 102. SunSoft president Ed Zander calls NextStep inadequate because it is tied to the hardware and predicts it will not run as well on Intel hardware.

Matt Kramer, PCShare's Plans To Boost PC Clients with Unix Need Work, *PC Week*, April 20, 1992, pp. 49, 56. Review of Helios USA's PCShare describes linking a Dell 333D PC to a NeXTstation Turbo Color, allowing the PC to log on to the NeXT, mount Unix volumes as DOS devices, and redirect DOS output to the NeXT PostScript printer.

Briefly Noted (item in Late News), *PC Week*, April 20, 1992, p. 138. Frame Technology and BOSS Logic will jointly market and distribute a Windows version of BOSS's Document Manager, now available for NeXT.

William F. Zachmann, 32-Bit GUI Alternatives: No Contest, *PC Magazine*, April 28, 1992, p. 192. Discussion of 32-bit GUI operating systems for Intel chips includes NeXTstep 486.

LuAnn Vitalis, New in the Resource Center, *BCS Update*, May 1992, p. 19. The Resource Center now has Illustrator 3.0 from Adobe and Ragnarok: Twilight of the Gods from David S. Joerg Productions.

Albert Willis, Apple Introduces QuickTime (item in The View from the BCS), *BCS Update*, May 1992, p. 21. Apple's QuickTime Movie Exchange Toolkit will support many platforms. "I think it's interesting that there isn't support for NeXT."

FORTRAN Math and Statistical Programming, *BYTE*, May 1992, p. 84. Product announcement for Absoft Corp.'s IMSL FORTRAN Libraries fror the Next.

Bruce Schneier, Untangling Public-Key Cryptography, *Dr. Dobb's Journal*, May 1992, pp. 16-18, 20, 22, 24, 26, 28. Sidebar "Public-Key Cryptography Meets the Real World" describes recent implementations. Next Inc.'s Fast Elliptic Encryption (FEE) algorithm may be more secure than RSA, although some researchers believe it is vulnerable to mathematical advances. Next plans to use the algorithm for security and authentication, pending NSA approval, to patent its speedups (although other patent applications could present complications), and to license the algorithm without royalties.

Create 1.1, *New Media*, May 1992, pp. 44-45. Product announcement for Stone Design's Create 1.1, listing new features of upgrade.

TypeView 1.0, *New Media*, May 1992, p. 47. Product announcement for Vivid Publishing's TypeView 1.0

Jeff Duntemann, Application Frameworks and Tools, *PC Techniques*, April/May 1992, pp. 43-44. Review of The Stepstone Corporation's APIpac V1.0, "a set of Objective C classes that, taken togeher, comprise an application framework.… Low-level system access is encapsulated in an object called a *context*, so that different platforms can be supported simply by linking in the appropriate context.… Objective C has an elegance about it that makes C++ look random and frazzled by comparison, and APIpac shares in that elegance. Give it an objective look."

Joe Hutsko, Susan Kare: The Face Behind the Interface, *Publish*, May 1992, p. 108. Interview with Susan Kare, the artist who was Next's creative director in 1986-88.

C. James Galley III, Inside, *PC Magazine*, May 12, 1992, p. 4. Strategies for testing Apple, NeXT, and Sun workstations for the issue's cover story.

Michael J. Miller, A Long Way from VisiCalc, *PC Magazine*, May 12, 1992, pp. 81-82. Discussion of advances in spreadsheets mentions Lotus Improv and Computer Associates' CA-Compete for NeXT (but soon for Windows) as supporting multiple views of a single model.

Jim Seymour, Platforms: How the PC Stacks Up, *PC Magazine*, May 12, 1992, pp. 113-117, 120, 122, 125. Introduction to cover story comparing PC, Mac, Sun, and NeXT. "Templation abounds. You want the power of a Sun workstation, the ease of a Macintosh, the cool elegance of a NeXTstation. But when it comes to getting your work done, you come back to the PC."

Jon Zilber, The Macintosh: The Choice for Graphics, *PC Magazine*, May 12, 1992, pp. 127-128, 141. Analysis of Macintosh for the issue's comparison of platforms mentions that the configuration tested was comparable in cost to a NeXTstation Turbo Color.

M. Keith Thompson, The NeXT Generation, *PC Magazine*, May 12, 1992, pp. 153, 161, 165. Analysis of NeXT for the issue's comparison of platforms. "NeXT combines Unix's power with the Macintosh's ease of use in an elegant, well-designed system. Here is one solution for companies that need custom applications, vertical-market solutions, and multimedia presentation tools running alongside standard productivity applications."

Julie Cohen, PCs: A Matter of Choice, *PC Magazine*, May 12, 1992, pp. 167, 170-171. Conclusion of this issues comparison of computing platforms. "Don't worry: You have chosen the right computer. No other platform has the widespread acceptance, the vast library of software, or the affordability of the Intel-based PC."

Executive Interview with Steve Jobs, *Oracle Magazine*, Spring 1992, pp. 10-14. Mission-critical custom applications interoperating with shrinkwrapped productivity applications and interpersonal computing will be added to the paradigm of the '80s. Object-oriented programming is a way to encapsulate complexity with clean interfaces, which provides greater code reuse, speed, and flexibility during development. Interpersonal computing is a new form of organization independent of geographic location and management hierarchy. A complete object-oriented development environment, which is not just a language but also includes a rich set of objects, allows the management of greater complexity. NeXT's Database Kit, which was developed in response to customers' request for objects to make database programming even easier, includes tools to work with several databases. Corporate data centers will move applications from mainframes to reduce costs and improve the user interface, and shift their emphasis from data management to application development because the bottleneck with data is the lack of applications. The computer industry is technology-driven: Apple was driven by the technology which made the PC possible and later by graphical user interfaces, IBM by Winchester drives, Sun by workstation and UNIX technology, and Oracle by database tech-

nology. "The most recent amd most profound technology shift I have seen since the Macintosh is object-oriented system software, which goes far beyond C++ and the simple things that people think it is." The business risk of adopting NeXT is exceeded by the technology risk of adopting technology that will not support desired applications. NeXT's customers are focusing on rapid custom application development. NeXT supports many standards, and as the shipper of a majority of object-oriented computers it is the de facto standard for object-oriented computers. NeXT's automated factory demonstrates that world-class domestic manufacturing is possible.

An X Above the Rest, RS/Magazine, April 1992, p. 10. Mentions Pencom Software Inc.'s co-Xist.

Keeping count (item in Tech Talk), *Computerworld*, April 27, 1992, p. 26. Next, Inc., part of team verifying largest known prime 2^{756389}-1 discovered at AEA Technology's Harwell Laboratory with 19 hours of calculation on a Cray-2 supercomputer.

Mark Brownstein, Beta testing begins for NextStep 3.0, *InfoWorld*, April 27, 1992, p. 8. NextStep 3.0 began beta testing last week, according to Steve Jobs at Federal Computer Conference West.

Robert X. Cringely, Dollars and Sense (item in Notes From The Field), *InfoWorld*, April 27, 1992, p. 98. According to the May issue of *Upside* , Next sales are one-tenth of the amount claimed.

Peter Coffee, Corporate Buyers Face Monstrous PC Decisions (editorial), *PC Week*, April 27, 1992, p. 72. "And with most corporate users now networked, buyers are 'free' (i.e., forced) to consider alternatives such as Macintosh, SPARC, NeXT and RS/6000 that are readily intermixed via the network. In some cases, they can even share floppy disks. Vendors attack the critical price point of $5,000 from all directions, each claiming a different advantage: ready availability of software and skills with PCs, mature ease of use with the Macintosh, multivendor networking with SPARC machines, ease of software development on the NeXT, raw power on the RS/6000."

POET, *C++ Report*, May 1992, p. 65. Product announcement for BKS Software's POET (Persistent Objects and Extended Database Technology).

Barry Gerber, The Bottom Line: Interoperability Means Saving Resources, *Network Computing*, May 1992, pp. 178, 180. The author declines to support other Unix systems (including NeXT) to avoid software differences.

Marcy J. Gordon, NeXTStep Stepped Over (letter), *Software Magazine*, May 1992, p. 8. NeXTStep, the only available object-oriented operating system, should not have been omitted from the March article "Object Technology Means Object-Oriented Thinking."

Rick Farris, DEC Challenges PC Pricing, *UnixWorld*, May 1992, pp. 71-72, 74. Review of Digital Equipment Corp.'s DECstation 5000/25. "Still, the 5000/25 is affordable. It deserves consideration if your business is waffling between DOS and UNIX and weighing PCs against low-cost Suns against Next systems against Sun clones."

Hardware & Software Support, *UnixWorld*, May 1992, p. 125. Listings for Absoft Corp.'s IMSL Complete Fortran Libraries Group of mathematical subroutines and RDR Inc.'s Powerpalettes for Interface Builder.

NeXT's Latest Step, *Workstation News*, May 1992, pp. 34, 38. NeXTstep Release 3.0 has additional connectivity software, tools for developing database and 3-D graphic applications, enhanced interpersonal computing, and integrated foreign language support and help systems. NeXT also announced NeXTstep 486, Turbo systems, a color printer, and a CD-ROM drive.

Clair Whitmer, NeXT, Taligent could be headed on collision course, *MacWEEK*, May 4, 1992, pp. 20, 22. NeXT "is beginning to find its niche" but Apple's Pink and RISC projects could give it competition. Apple says Taligent's object-oriented Pink software is for "large companies to develop custom software for network workgroups," NeXT's targeted market. NeXT's vice-president of marketing, Mike Slade, credits Taligent for legitmizing NeXT's position that the "object is the advantage." Analysts say NeXT has at least an eighteen-month window to exploit its object-oriented advantage.

Quabidur R. Safi, SoftSolutions Eases Retrieval, *PC Week*, May 4, 1992, p. 38. MS-DOS text retrieval software tested by search for "NeXT."

Mark B. Bundick, Next on the Agenda (letter), *PC Week*, May 4, 1992, p. 84. Response to March 23 review of Turbo Color, report on Windows problems, and column advocating porting Windows to Unix praises NeXT.

NextStep Versions in the Works (item in Late News), *PC Week*, May 4, 1992, p. 150. Beta test of NextStep 3.0, due in June, has begun. Beta test of NextStep 486 will follow.

Rumor Central: Beam Me Up, Scotty! I Think We've Seen This Movie Already, *PC Week*, May 4, 1992, p. 150. At Hambrecht & Quist conference, Steve Jobs discussed NT. "It's Microsoft's second attempt at [being] a Unix wannabe. It's better plumbing for Windows. You're still stuck with the worst development environment."

Rich Karlgaard, Upside's side (letter), *InfoWorld*, May 11, 1992, p. 38. *Upside* response to Cringely's April 27 column about its cover story on Next states article states the $350 million figure appeared in another publication and reminds readers that the cover art is a caricature.

Robert X. Cringely, Menage a Trois? Not! (item in Notes From The Field), *InfoWorld*, May 11, 1992, p. 106. Next may replace the 88110 by IBM and Motorola's PowerPC because it does not expect Motorola to be able to simultaneously develop all its microprocessor families.

Jon Swartz, Microsoft, NeXT discussions reported, *MacWEEK*, May 11, 1992, p. 24. Microsoft and NeXT are discussing a deal in which Microsoft would port its Word and Excel programs to NeXT in exchange for partial rights to NeXTstep.

Steve Rosenthal, Developer tools reach out across platforms, *MacWEEK*, May 11, 1992, pp. 28, 30, 32. A paragraph about Abacus Research and Development Inc.'s Executor will cost $80 per application on a list of 28 major applications, but may be used to run other compatible Macintosh applications.

Mitzi Waltz, The state of Mac development tools, *MacWEEK*, May 11, 1992, pp. 28, 30, 32. "Gregory Dow, chairman of the board at BMUG Inc. of Berkeley, Calif.., and leader of its Programming Special Interest Group, said: 'Every year there are machines that are twice as fast as the machines before them, yet people are developing software with the same programming languages and tools they were using five, 10, even 20 years ago.' Innovations such as the NeXTstep Interface Builder from NeXT Computer Inc. get industry raves but are slow to spread, he added. Object-oriented programming, once hailed as the panacea for speeding up Mac development, can't do the job alone. '[Ap-

ple's] object-oriented stuff is nice,' [Objective Software's vice president for Objective Software Inc.] Mashima said, 'but it doesn't solve [the problem]. I wish Apple had an environment like the NeXTstep Interface Builder, because we spend over half of our time doing interface work. It would help our prototyping process.'"

Paul M. Sherer, SoftPC Emulation Software To Let Users Run Win 3.1 on SPARC PCs, *PC Week*, May 11, 1992, p. 62. The new SPARC version of SoftPC from Insignia Solutions will emulate an 80286 in protected mode, supporting Windows 3.1. According to Insignia's director of OEM sales, Douglas Reid, "there are very meaningful discussions going on" with NeXT and other vendors.

Paul M. Sherer, NeXT Sends NextStep 3.0 into Beta, Readies Version for Intel-Based 486s, *PC Week*, May 11, 1992, p. 62. NextStep 3.0 went into beta test in April, and NextStep 486 will enter beta test in June. According to Steve Jobs, OEM deals for NextStep 486 have already been finalized.

Orrin C. Kerr, NeXT Is Worth a Look (letter), *PC Week*, May 11, 1992, p. 68. Response to March 23 "Looking Forward" column. "Take a close look at NextStep. It has all of the practical capabilities of Windows, but it is better design.... I have 12 years' experience in the computing industry, and this is the finest interface I have run across. Never have I seen a platform that so smoothly insulated the end user from the intricacies of the operating system. Windows is positively clumsy in comparison. And with all the objects included with the system check out Interface Builder to see true added value), it is truly a delightful bargain."

Jim Seymour, A Game-Software Ruling That's Deadly Serious, *PC Week*, May 11, 1992, p. 69. Sega's lawsuit against game-software publisher Accolade for producing software without a license from Sega demonstrates an attitude different from the traditional view that a wide variety of software helps the hardware vendor. "Steve Jobs' evangelism among developers for the NeXT platform is legendary."

Mark L. Van Name and Bill Catchings, Computer, Do What I Say, Not What I Type!, *PC Week*, May 11, 1992, p. 72. Discusses voice I/O on PCs. "If this sounds too blue-sky to you, check out a NeXTstation. These systems, which we first tested more than 15 months ago, allow exactly the kind of operation we just described, and each comes standard with a microphone built into its monitor."

On deck (item in Short Takes), *PC Week*, May 11, 1992, p. 131. Apple may follow NeXT with an operating system for Intel processors.

Bob Metcalfe, We're stuck in the third age of computing: What's next?, *InfoWorld*, May 18, 1992, p. 49. "It's just a bit amusing that there are now several million young computer users who tend to think that the entire history of computing can usefully be divided into the times 1) before Windows, 2) before Windows 3.1, and 3) the grand future, the latest computer revolution. Let's get those people to visit the Computer Museum, in Boston. They'll see that Bill Gates did not invent everything after binary arithmetic and that Steve Jobs had a company before Next—back when Apple computers were still called PCs."

Jon Swartz, Quorum suit challenges Apple, *MacWEEK*, May 18, 1992, pp. 1, 98. The article about Quorum Software Systems Inc.'s Latitude Macintosh emulator does not mention a NeXT version, although NeXTstep is listed among the Unix interfaces it could use.

Don Crabb, A/UX 3.0: Promises delivered and the future revealed, *MacWEEK*, May 18, 1992, p. 33. "A/UX 3.0 actually is a pleasure to use; having the Finder and desktop as your Unix graphical user interface beats Motif, Open Look, X Window or whatever else you might find in the Unix world (except, of course, for NeXTstep) hands down."

Christopher Stetson and Eamonn Sullivan, Adobe Illustrator 4.0 Not Quite Picture-Perfect, *PC Week*, May 18, 1992, p. 13. Review of Adobe Systems Inc.'s Illustrator 4.0 for Windows finds it slower than the Macintosh or NeXT versions.

Jane Morrissey, Third-Party Software Crucial To NeXT's Step into 486 Turf, *PC Week*, May 18, 1992, pp. 189, 192. NextStep 486 will only be a "niche player" because of its price and lack of applications. NeXT is expected to demonstrate NextAStep 486 and announce the first OEMs at PC Expo. Chrysler Financial Corp. is choosing between NextStep 486 and Windows for 3000 systems. Jobs says all third-party applications will be ported to the 486.

Simson L. Garfinkel, Let's not forget the NeXT! (letter), *BCS Update*, June 1992, p. 5. John Xenakis told *NeXTWORLD* senior editor Garfinkel that he did not mention NeXT in his March *BCS Update* article "Unix on Your Desktop" because "NeXT is in a class by itself."

LuAnn Vitalis, New in the Resource Center, *BCS Update*, June 1992, pp. 19-21. BCS Resource Center adds Adobe Illustrator 3.0.1.

Michael Nadeau, The 1992 Readers' Choice Awards, *BYTE*, June 1992, pp. 121-124, 126. "The third item [of four worth noting] is Next's Nextstation, which tied for first place in the workstation category with IBM's RISC System/6000. Sales figures do not reflect this result, of course. You don't have to own a product to vote for it (after all, state of the budget usually takes precedence over state of the art). Perhaps Next's fortunes are about to take a turn for the better."

Barry Nance, Windows NT and OS/2 Compared, *BYTE*, June 1992, pp. 359-360, 362. "Many in the shrink-wrap camp will divide into two or more teams and write versions of their products for both NT and OS/2, with perhaps versions for Unix, NextStep, and the Mac."

Sydney S. Weinstein, You asked for it—X, *The C Users Journal*, June 1992, pp. 63-64, 66, 68-69. Recent postings to comp.sources.misc include new versions of the IOzone I/O benchmark and IScreen windowing package for character terminals with NeXT support added.

Larry Press, Collective Dynabases, *Communications of the ACM*, June 1992, pp. 26-32. Mentions NeXT client software for Thinking Machines's wide area information servers.

Lee Sherman, Industrial-Strength Multimedia from NeXT, *New Media*, June 1992, pp. 16-19. Survey of NeXT hardware platforms and multimedia authoring software notes shortage of vertical products for animation, MIDI, and image manipulation and lack of standard movie format like QuickTime. Thoughtful Software's HyperCube, Xanthus International AB's CraftMan, and Imagine Multimedia's MediaStation and InterActive Author are the authoring systems discussed.

Dan Lavin, Imagine's MediaStation: NeXT Multimedia Jack of All Trades, *New Media*, June 1992, pp. 36-37. Review of Imagine Multimedia Inc.'s MediaStation. "Despite its drawbacks, MediaStation is ideal for a broad range of multimedia purposes, including education, authoring and presentations. Imagine is