■ **Intel Pushes Covington to 300 MHz**

Activity at the low end of the PC market continues to race ahead faster than Intel can respond. Just a few weeks after announcing it would follow the initial 266-MHz Covington (see MPR 4/20/98, p. 14) with a 300-MHz Mendocino in 4Q98, the company abruptly changed plans, adding a 300-MHz Covington with a July release date. Intel attempted to characterize the change as a response to "better-than-expected yield" on the Deschutes CPU, allowing it to divert more Deschutes chips into low-end Covington processors.

Intel claims it is merely coincidence that the 300-MHz Covington was added shortly after both AMD and Cyrix rolled out their own PR300 products at low-end price points (see MPR 4/20/98, p. 5). Intel denies that the Covington upgrade is an attempt to address poor media response to the 266-MHz Covington, which is outperformed by a Pentium/MMX-233 on many application-based benchmarks.

Because the faster Covington will be marketed as the Celeron-300, Intel will be forced to start Mendocino at 333 MHz, so it can be sold as the Celeron-333. Intel is now saying Mendocino will begin system shipments in October, but this is still too late to get the part into most Christmas systems.

Intel stopped short of officially announcing a price for the Celeron-300. We expect it to debut at about $155, the current Celeron-266 price, while the slower part drops to around $100. Even at this price, we expect moderate acceptance of the initial Celeron parts, since Pentium/MMX is still less expensive for the same performance. Intel's current pitch to OEMs is that they should build Celeron systems now to prepare for the Mendocino upgrade in just four months.

Intel has confirmed our speculation that the desktop Mendocino will have 128K of on-chip L2 cache. Sources indicate the company is also developing a mobile version of the part, code-named Dixon, that will have a 256K cache on-chip. Unlike Mendocino, Dixon will be marketed under the Pentium II brand and will appear at the high end of the mobile line. With the larger cache, Dixon should match or exceed the performance of the Mobile Deschutes on most benchmarks while achieving lower power dissipation. We expect Dixon to be popular in notebook PCs in 1999.　　*—L.G.*

■ **IBM Rolls Out 6x86MX at PR333**

Taking advantage of a process shrink, IBM has announced faster versions of its Cyrix-designed 6x86MX processor. The new PR300 and PR333 versions are now sampling and will ship in volume later this month. The new speed grades are achieved by moving the chip to IBM's hybrid 0.25-micron process known as CMOS-6S2. The PR333 version runs the CPU at 250 MHz and the Socket 7 bus at 83 MHz. The PR300 comes in two flavors, 233/66 MHz and 225/75 MHz.

As the PR numbers indicate, these processors match up against Pentium II at 300 or 333 MHz on basic PC applica-

tions, as measured by IBM using the Winstone 98 benchmark. Cyrix recently announced a PR300 part (see MPR 4/20/98, p. 5) and expects to roll out its own PR333 soon.

Unlike Cyrix, IBM is continuing to market the chip under the 6x86MX moniker along with the PR number. Cyrix is now using the M II brand name and has dropped the PR. IBM believes the 6x86MX name has gained significant recognition, particularly in Europe, and is concerned that dropping the PR may confuse buyers into thinking a "300" actually runs at 300 MHz.

In 2H98, IBM will build the 6x86MX in CMOS-6X, a true 0.25-micron process, enabling PR350 and eventually PR400 versions that both vendors will market. IBM plans in 1999 to move the chip to CMOS-7S, its 0.22-micron copper process (see MPR 8/4/97, p. 14), allowing even faster parts.

Further plans are unclear. IBM and Cyrix are still working out plans for the deployment of Cyrix's forthcoming Cayenne core (see MPR 10/27/97, p. 22), an upgrade to the 6x86MX. Cyrix plans to deploy Cayenne in an integrated product known as the MXi, but IBM isn't interested in marketing integrated chips. Cyrix has been backing away from plans to design a Slot 1 version of Cayenne, but IBM continues to push for such a product, if only for its own use. Without a nonintegrated Cayenne product, IBM's x86 roadmap may be stymied.

IBM's list prices (in 1,000-piece lots) for the PR300 and PR333 are $217 and $299, respectively. In comparison, Cyrix's PR300 lists for $180, and Intel's Pentium II-300 lists for $375. For more information on IBM's x86 processors, access *www.chips.ibm.com/products/x86.*　　*—L.G.*

■ **Cyrix Breaks Packard Bell Stronghold**

Gaining a key top-tier design win, Cyrix announced that Packard Bell NEC will use its MediaGX and M II processors in consumer PCs. Although Packard Bell has been losing market share for the past two years, it is still the leading PC vendor in the U.S. retail market and ranks number five in worldwide PC sales. Cyrix also announced that Wyse will use the MediaGX in a family of Windows terminals.

Until now, Packard Bell has been an all-Intel shop, making this announcement a bit of a surprise. On the other hand, the PC maker focuses on the U.S. retail market, where the sub-$1,000 PC has made the biggest splash. By using Cyrix processors, Packard Bell can deliver systems at lower price points than it can using Intel chips. With Packard Bell's defection, only Dell and Gateway remain Intel stalwarts.

Cyrix has been looking for a big design win ever since losing much of its Compaq business to AMD (see MPR 1/26/98, p. 1). With Cyrix looking to add National's fab capacity to the wafers it gets from IBM, it needs some major customers to consume more chips. Packard Bell NEC should fit this bill nicely.　　*—L.G.*

Keith Diefendorff Named Editor in Chief of Microprocessor Report

After five years at the helm of this newsletter, I am pleased to announce that Keith Diefendorff has joined MicroDesign Resources as the new editor in chief of *Microprocessor Report.* Many of you already know Keith from his many presentations at Microprocessor Forum and other industry conferences. He is widely recognized as one of the world's leading microprocessor architects, and his broad experience in the industry makes him an excellent leader for this newsletter.

Keith first made his mark on the industry at Motorola, where he was the chief architect of that company's PowerPC and 88110 microprocessors. These RISC processors were known for their strong price/performance, and the 88110 was the first general-purpose CPU with multimedia extensions.
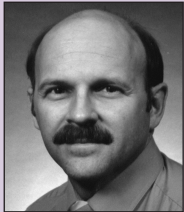
Keith then served as the Director of Technical Strategy at NexGen/AMD, where he was intimately involved in the company's x86 processors and its efforts in the PC market. Prior to joining MDR, Keith was a Distinguished Scientist at Apple, where he directed all of Apple's microprocessor initiatives. While at Apple, Keith served as chief architect of the AltiVec multimedia extensions (see MPR 5/11/98, p. 1).

With 25 years of experience in RISC processor design, x86 processor design, and computer-system design, Keith is well-versed in the issues that *Microprocessor Report* covers. He is also an experienced writer, having authored many technical papers and articles in the leading journals.

Keith's first article for *Microprocessor Report* appears in this issue (see MPR 6/1/98, p. 22); you'll be reading a lot more under his byline in the future. As editor in chief, he is also responsible for the day-to-day editorial operations of the newsletter.

I will serve as editorial director, providing general editorial direction, and will continue in my role as publisher, managing the business side of the publication. I will also continue to contribute articles and editorials. I'll be spending much of my time working on some exciting new products that I'll be able to tell you about later this year. Michael Slater will continue to guide the publication in his new role as executive editor.

I have no doubt that Keith's experience and technical savvy will add to this publication. Please feel free to contact either Keith or myself with any feedback (see MPR 6/1/98, p. 2 for contact info). Thanks for your support.   —*L.G.*

■ Savage3D to Salvage S3

Having missed the sudden growth of the mainstream 3D market in 1997 and relinquished market leadership to competitor ATI, S3 is poised to redeem itself with its Savage3D graphics accelerator. The new device offers 2D and video features comparable to those of other mainstream graphics chips. It adds a 3D rendering engine capable of drawing 125 million trilinear-filtered pixels per second, more than 3Dfx's three-chip Voodoo2. Although Savage3D won't be the fastest new desktop graphics accelerator this year—Nvidia's Riva TNT achieves twice the peak pixel-fill rate—the Savage3D will clearly be among the best chips in its category.

S3's survival without a competitive 3D chip is a testament to the company's tenacity. Last year's Virge GX/2 (see MPR 4/21/97, p. 4), offered fewer features and much lower effective performance than rival ATI's Rage Pro . S3 was forced to position and price the GX/2 almost like a 2D-only graphics chip. Low-end customers are exceedingly price-sensitive, and S3 found it difficult to price the GX/2 low enough to overcome even older, less sophisticated graphics chips. S3's own Virge DX, though nearly a year older, turned out to be a better fit in $39 add-in cards, leaving the GX/2 with almost no market at all.

Although S3 fell far short of its financial goals for 1997 (experiencing a 37% drop in net sales in 1Q98 from 1Q97), it actually increased R&D spending by 17% (for the same quarters). Other companies might have thrown in the towel (as Cirrus Logic and Oak did), but S3 believed it had the resources to develop one more market-leading graphics chip. In effect, S3's management bet the whole company on the Savage3D effort, and it looks like they made the right choice.

Savage3D won't save S3 all by itself. The graphics vendor will face even more competition this year than last; we expect to see at least seven other 3D accelerators this year with fill rates exceeding 100 Mpixels/s. S3's success will depend even more heavily on its ability to leverage its classic strengths in PC graphics: driver quality, OEM support, strategic relationships with application-software developers, and end-user brand awareness.

If S3 can combine Savage3D's competitive technology with the same aggressive marketing and sales tactics that kept the company afloat during last year's technology drought, it may find itself on top of the PC graphics market once again by this time next year.   —*P.N.G.*

■ S3 Sues Nvidia over Cirrus, Pixel Patents

In other news, S3 has filed suit against Nvidia, alleging that Nvidia has violated S3's U.S. patents 5,402,513, 5,581,279, and 5,625,379. The first of these patents was originally assigned to Pixel Semiconductor but was presumably acquired by S3; the other two are patents S3 purchased from Cirrus Logic (see MPR 2/16/98, p. 5). The first patent covers

a video-window processor with scaling and YUV-RGB conversion circuitry. The second describes a single-chip VGA accelerator with an on-chip clock generator, while the third pertains to a digital-video controller with interpolation and YUV-RGB conversion circuitry.

Whether these patents are valid, and whether Nvidia has violated them, is up to the courts to decide. The patents are fairly broad and appear to cover techniques that are used widely throughout the industry. If the court decides in S3's favor, S3 will probably go after other graphics-chip makers. S3 may have chosen Nvidia as its initial target to disrupt that company's pending stock offering.

The value of the patent cross-license agreements and royalties S3's patents could bring may greatly exceed the $40 million S3 spent to acquire them. With Silicon Graphics, Real 3D, and other historical innovators in high-end 3D implementations moving down into the PC market, these patents—which cover critical territory for single-chip graphics accelerators—may give S3 additional leverage.　—*P.N.G.*

■ Micron Defines Mysterious "Socket X"

Answering a question few chip vendors have asked, the Micron-led Socket X Consortium proposed at PC Tech Forum a new pinout for desktop graphics controllers. Micron's stated goal in developing the new standard, in cooperation with chip-vendor Rendition, is to make it easier for motherboard designers and system OEMs to shop around for graphics chips by providing a vendor-independent pinout. Market-leading graphics-chip vendors S3, ATI, Matrox, and Nvidia, however, have not announced plans to support Socket X, casting doubt on its future.

Socket X defines new 303-pin BGA and socketable PGA footprints for 2D-only and 2D/3D accelerators. The proposed pinout provides for a 2× AGP system interface, two analog RGB outputs, one digital RGB output, digital video input through the VESA VIP 2.0 bus, and both composite and S-Video analog video outputs. Socket X does not include a local memory interface, however, limiting it to embedded-DRAM, multichip module, and possibly unified memory architecture designs.

The omission of a local-memory bus may be a fatal error. All of today's desktop graphics controllers use discrete local graphics memory. The few embedded-DRAM chips have been limited to notebook PCs, whose smaller frame buffers are better suited to on-chip memory.

Desktop graphics subsystems that use discrete SGRAM or SDRAM will be more affordable, a great advantage in the cost-sensitive desktop PC market. While embedded DRAM can provide greater bandwidth and use less board space than discrete solutions, these advantages are of secondary importance in desktop systems. Even the fastest announced graphics chips get enough bandwidth from commodity SGRAM, and board space is less important than total system cost to most OEMs.

The Socket X announcement may herald the arrival of a new class of desktop graphics-accelerator chips, but we believe other solutions will be more successful. The AGP slot provides vendor independence for OEMs that need it. Future core-logic chip sets with integrated graphics, such as Intel's Whitney (see MPR 4/20/98, p. 18), and CPU-plus-graphics products, including National/Cyrix's MXi and promised single-chip PC (see MPR 4/20/98, p. 4), will provide much more important cost reductions for the growing sub-$1,000 PC market. Without support from the leading 3D-chip vendors, Socket X has little chance of becoming a legitimate standard in the PC market.　—*P.N.G.* Ⓜ