13 • May • 02 V.9.19

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WaferNEWS

THE SEMICONDUCTOR EQUIPMENT AND MATERIALS WEEKLY BRIEFING

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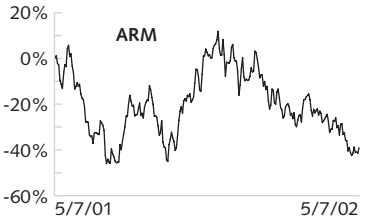
In the spotlight



Percentage change in ARM stock price, which was $10.10 on May 7th, 2002, compared to $16.57 a year ago. See related story, page 3.

WaferNews source: CNET Investor

Inside:

Published weekly by

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Producers cautiously optimistic recovery has legs

Chipmakers at SEMI's Strategic Business Conference in Welches, OR, were cautiously optimistic that the recent uptick in business was not just an inventory bubble, but the start of sustainable improvement in the chip market.

Producers think they're seeing real demand as the economy improves. Most optimistic were the foundries and contract assemblers like TSMC and Amkor, likely to benefit from the IDMs' reluctance to pour more money into new capacity of their own.

"We're seeing particularly strong buying activity in the consumer area," said TSMC North America President Ed Ross. "DVDs are extremely strong. We see what seems to be a sustainable broad-based recovery. We'll see next quarter if it was an inventory bubble, but we don't think so. Demand for leading edge technology has been surprisingly strong."

Other sectors are seeing marked improvement in demand as well.

ON Semiconductor Senior VP and Chief Manufacturing Officer William George said his company's sales of high-volume, low-cost products have been exceeding its forecasts since December. LSI Logic similarly has been beating its internal forecasts since the start of the year, and its fab loading has improved significantly, on demand first for consumer products, and now for storage as well.

"Our 0.18 capacity is getting close to full all of a sudden," said Norm Armour, VP and GM of the company's Gresham, OR, fab. "Utilization jumped from 40 to 80% in about a month."

Though it's not obvious what end user systems demand is going to soak up all these chips, just refilling the inventory supply chain will help.

"There's been so much reliance on reducing inventories," noted Jim Feldhan, president of Semico Research. "That modest growth in the market, and bring-

See **RECOVERY** *continued on page 6*

Fab update: Rush to shrink geometries accelerates; companies divided over 300mm benefits

Most major chipmakers presenting at SEMI's Strategic Business Conference, Welches, OR, were touting their rush down an ever faster technology curve, with 130nm this year, 90nm next year, and 65nm in 2005. But there was no agreement on the pace of changeover to 300mm wafers.

TSMC sees 50% at 300mm in four years

TSMC will invest almost its entire $2.5 billion capital budget this year in ramping 300mm production, and the company expects to have about 50% of its capacity in 300mm wafers within three to four years. The company is now installing tools in its newest 300mm Fab 14, aiming at starting production in 2Q03, with eventual capacity of 30,000 wafers/month, in a giant 23,000m^2 cleanroom. Meanwhile the company is also ramping its 300mm Fab 12, which started manufacturing in December, aiming at capacity of 25,000 wafers/month. Both will run from 150- to 90nm geometries.

See **FAB UPDATE** *continued on page 6*

DRAM demand drives 1Q02 chip sales to $32.25B

March sales hit $10.75B, up 7.2% from February

Worldwide chip sales in March totaled $10.75 billion in March, a 7.2% increase from the $10.03 billion reached in February, and the highest monthly sequential increase since April 1986, according to the latest report from the Semiconductor Industry Association (SIA).

"Led by strong DRAM sales, this is a record rise in first quarter growth for the semiconductor industry," noted George Scalise, SIA president. "The March quarter sales are another sign that the industry is rebuilding from 2001, with growth in all major geographic regions except Japan, which was flat.

"The sales increase was dominated by a record 82.4% sales rise in the DRAM market, with essentially flat sales in other product areas as forecasted. The DRAM sales are a result of increased demand and price increases from the depressed levels of 2001."

Scalise went on to remark that quarterly growth of 5.6% indicates that inventory build-up has been worked through and product demand is now beginning to pick up.

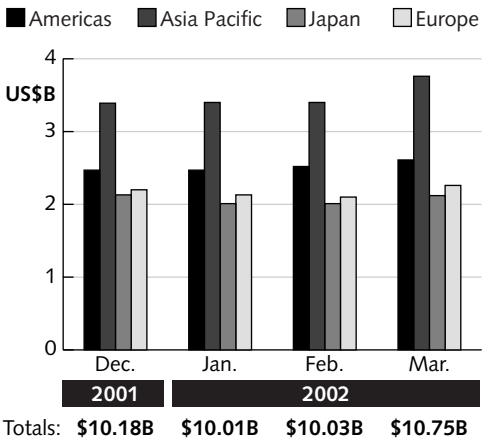
"The outlook for the second quarter is for single-digit sales growth followed by stronger growth rates in the second half of the year," stated Scalise. "As expected, the semiconductor industry should close out 2002 with modest but sustained overall growth."

On a month-to-month basis, the Asia Pacific market led the sales increase with a 10.4% rise over February, while Europe and Japan grew 7.7% and 5.7%, respectively. Sales in the Americas grew a steady 3.6% over last month. During March, growth occurred uniformly across most product sectors.

Semico Research, Phoenix, AZ, suggested that SIA's latest statistics lend credence to its bullish forecast for 2002. Even after the events of September 11, the Semico forecast remained positive at 17% growth for 2002.

"[SIA's] strong sales data for 1Q02 adds to the mounting evidence that Semico's contrarian forecast may be on the mark," Semico remarked. "First quarter chip sales are typically weak compared with the previous year's final quarter. But SIA data showed 1Q02 sales increased 5.6% from 4Q01. Since 1989, only one other year exceeded this 5.6% growth. That was in 1995, when 1Q95 was up 8.8% from 4Q94. How did growth end up for 1995? It turned out to be one of the strongest years on record for the semiconductor industry with 41% growth. So 2002 may yet play out according to Semico's forecast."—*M.W.*

Worldwide semiconductor sales, by region



WaferNews sources: SIA, WSTS

Mind matters: Chip IP market up, says Dataquest

The worldwide semiconductor IP market bucked the trend of the overall semiconductor industry in 2001 by achieving a successful year, with revenue totaling $892 million, a 25% increase from 2000's $714 million, according to Dataquest Inc., a unit of Gartner Inc.

The top three vendors, ARM, Rambus, and MIPS Technology, dominated the market, although the three leaders as a group lost share compared to smaller vendors (see table).

"The reduction in market concentration is a demonstration of IP market immaturity," said Jim Tully, chief analyst for Dataquest's semiconductor industry worldwide group. "There was relatively little merger and acquisition activity among market leaders, so new market entrants

See **DATAQUEST** *continued on page 11*

Briefs...

GE Capital to lease chipmaking equip— *GE Capital Leasing Corp., Stamford, CT, is set to start leasing semiconductor equipment, and will sell used equipment. According to the* Financial Times, *the move follows GE Capital Leasing's acquisition of all the assets of Comdisco Equipment Solutions Inc.*

Amkor completes acquisition of Citizen's assembly biz— *Amkor Technology Inc., Chandler, AZ, has completed its acquisition of the semiconductor assembly business of Citizen Watch Co. Ltd. Terms of the transaction were not disclosed, but involved an initial cash payment to Citizen, with additional payments to be determined by revenue streams over the next year. Amkor has acquired the assembly operations, together with Citizen's IC packaging IP, and hired 83 employees.*

NEMI signs four members— *The National Electronics Manufacturing Initiative (NEMI), Herndon, VA, has signed four new members: CALNET Inc., the Centre for Microelectronics Assembly and Packaging (CMAP), Orbotech, and Sun Microsystems Inc. CALNET is a systems engineering and IT consulting firm. CMAP is a multi-university, multi-company consortium that conducts fundamental and applied research of direct relevance to the microelectronics industry. Orbotech is a provider of technology solutions used by electronics manufacturers, and Sun is a provider of industrial strength hardware, software, and services that power the Internet.*

Briefs...

Harris & Harris invests in Nanotech— *Harris & Harris Group Inc., New York, NY, has invested $750,000 as part of a $6.3 million series B convertible preferred financing of Nanotechnologies Inc., Austin, TX. Nanotechnologies was founded in 1999, to develop and commercialize a process for synthesizing nanoscale materials using a proprietary plasma-based technology to produce a variety of materials. The investment in Nanotechnologies reflects Harris & Harris' decision to focus its business on small technologies like nanotechnology, microsystems, and MEMS.*

KT Venture appoints general partner— *KT Venture Group LLC, the investment partner of KLA-Tencor Corp., has appointed Mahesh Krishnamurthy to serve as general partner. Krishnamurthy is chartered with managing the group's investments in early-stage start-up companies within the microelectronics sector, including semiconductor manufacturing and service technology, MEMS, photonics manufacturing and capital equipment, nanotechnology, and biochip markets.*

Therma-Wave files suit against Boxer-Cross— *Therma-Wave Inc., Fremont, CA, has filed a patent infringement suit again Boxer-Cross, Menlo Park, CA. The suit alleges that Boxer-Cross' BX-10 product infringes certain patents held by Therma-Wave. Boxer-Cross refutes the claims.*

Cadence completes acquisition— *Cadence Design Systems Inc., San Jose, CA, has completed its acquisition of Plato Design Systems Inc., San Jose, CA, a privately held design technology firm. Financial terms were not disclosed.*

New die-separation process increases throughput

It is hard to imagine disruption of conventional wafer-to-tape mounting carriers used with wafer dicing in semiconductor assembly, but a newly patented wafer mounting technique (US patent 6,383,606, May 7, 2002) from Diamond Touch Technology Inc. (DTTI), Prescott Valley, AZ, brings a whole new set of capabilities and productivity to dicing and scribing.

Dubbed DiaFrame, the new frame greatly eliminates die edge chipping problems associated with conventional processes, prevents tape sagging — which is an increasing problem with large wafers — and enables a new high throughput sequence of scribing and die separation.

Briefly described, DiaFrame is a tape mounting ring designed with a novel "S" shaped strain relief diaphragm around its inner circumference.

DTTI CEO Michelle Broyles tells *WaferNews*, "In its natural state with mounting tape attached to the diaphragm, but without a wafer, the tape follows the shape of a plane cutting a chord across a sphere, with a chord depth of approximately 500µm."

As with conventional frames, the tape is coated with a high tack, heat, or UV-release adhesive to which wafers are attached using conventional mounting tools.

"Attachin the wafer to the sticky tape, the DiaFrame is forced flat by the strength of the wafer, with the compression absorbed by the S-shaped relief structure on the diaphragm," says Broyles. The mounted wafer is now ready for sawing or scribing by any conventional means.

What isn't conventional, however, is that once the DiaFrame mounted and diced wafer is released from the vacuum chuck of a saw or scriber, the tape and attached die dome up, separating each die by 18- to 50µm depending on the specific wafer and DiaFrame.

Engineers at DTTI have incorporated the DiaFrame into a proprietary Scribe & Fracture process that is capable of singulating wafers (up to 300mm) faster than existing technologies, with improved yields. A DiaFrame mounted wafer is scribed on a DTTI DS system. The optimum scribing speed for silicon is ~3 in/sec, done with a position accuracy of 0.025µm with no cumulative errors produced during the scribing of multiple streets. The individual scribe lines are ~3µm wide and 1µm deep. Once scribing is completed all the streets are fractured simultaneously — in milliseconds — by forcing a metered supersonic puff of air through the chuck.

"While experiencing no losses in yields, this fracturing speed is over 200% faster than current scribe and break processes that require mechanically linked breaker bars striking the wafer or positioning and moving a mechanical roller on the top of the wafer above a static breaker bar," explains Broyles.

She continues, "Our testing has demonstrated this new method eliminates the need for heat and stretching steps and associated equipment, and produces no measurable dust or liquid hazardous waste when used with GaAs or silicon wafers."—*P.B.*

SEZ America launches 300mm lab

The Austrian-based SEZ Group has opened a 3,000 ft^2 300mm applications lab in Phoenix, AZ, to help its customers establish production-viable wafer cleaning and wet etch processes. At the root of SEZ's capabilities is its unique single-wafer multiple-zone tools that enable very tight control of sequential conventional wet cleaning and etching chemistries. SEZ has also developed an impressive array of front and backside automated wafer handling subsystems, including the ability to handle chemically thinned wafers (e.g., 70µm-thick 300mm wafers).

While the new lab's focus is customer support for production processes (not R&D), during opening day tours SEZ technologists briefly described their work on a wet-etch-based CMP alternative that may be possible in the near future, if current copper electroplating development work continues to provide flatter films.

Speaking at the lab's dedication, Jim Feldhan, president the market research firm Semico Research, said, "This is the exact right time for suppliers to be preparing for the ramp of 300mm production equipment." Feldhan foresees 300mm fabs facilities taking off again, as the substrate of choice for 130nm technology. He anticipates that 300mm will reach parity with 200mm in 2006, at which time 99% of 130nm technology will be fabricated on 300mm wafers.—*P.B.*

B I T L I N E S

Wonder woman— Ann Marie Rincon, a senior technical staff member at IBM in Burlington, VT, has won the Marie R. Pistilli Women in EDA Achievement Award, announced Jan Willis, chair of Workshop for Women in Design Automation and VP of business development at Simplex Solutions Inc. The award, named for the former organizer of the Design Automation Conference, Marie R. Pistilli, is presented annually to the individual who has visibly helped advance women in EDA. "She is a beacon of success for women seeking to build their careers on the technical track, having combined a string of technical accomplishments with strong customer relationships and industry service," noted Willis. Rincon is recognized as a worldwide expert on the ASIC design methodology, and led the development of IBM's SoC design methodology. She was a key member of the team that defined IBM's OEM design methodology for high-density, high-performance ASICs. A 20-year IBM employee, Rincon has filed nine patents and is an author of the *Wiley Encyclopedia of Electrical and Electronics Engineering.*

Go tiny Joe— The Massachusetts Institute of Technology, Cambridge, MA, was awarded a requirements contract with the potential of $70 million for developing the Institute of Soldier Nanotechnologies University Affiliated Research Center as the center of excellence for the Army. The purpose of this research center is to develop unclassified nanometer-scale science and technology solutions for the soldier. The contractor will work closely with industrial partners and with Department of Defense research organizations to accelerate the transition of research to products with potential military application to enhance soldier survivability. Work will be performed in Cambridge, and is to be completed by April 30, 2007.

Say cheese— Researchers at Rensselaer Polytechnic Institute (RPI), Troy, NY, have discovered that single-walled carbon nanotubes (SWCN) emit a loud pop and then ignite when exposed to a conventional photographic flash. This discovery could mean that SWCNs might be used in light sensors or to remotely trigger explosives and combustion reactions. Pulickel Ajayan and Ganapathiraman Ramanath, RPI professors of materials science, explained that the loud popping sound heard after the flash is actually a well-known phenomenon called the photo-acoustic effect, known since Alexander Graham Bell's time. This phenomenon had not previously been associated with carbon nanotubes. What surprised the researchers even more was the fact that the nanotubes then spontaneously ignited and burned upon photographic flash exposure. "The single-walled carbon nanotube samples in this situation were just a jumble of tubes. They were not laid out in any pattern, and because of that, the heat generated from the flash could not dissipate, so the nanotubes just burned," explained Ajayan. Remarked Ramanath, "To the best of our knowledge, no other material emits such a loud sound and ignites spontaneously when exposed to unfocused low-power light; this adds to the long list of unique properties of carbon nanotubes."

Timely tome— Stanley Wolf at Lattice Press (www.latticepress.com) — the industry's most prolific writer of text books on IC technology and processing — has just published Volume four of *Silicon Processing for the VLSI Era.* This volume is unique because it is dedicated to deep-submicron processing technology, using over 200 references published since 2000. Wolf told *WaferNews*, "Its sole focus is those techniques needed to manufacture chips for 180nm and smaller generations." Wolf claims that learning about these new technologies has not been easy for industry engineers recently because of corporate travel restrictions and training budget cuts. One objective in compiling Volume four was to provide an alternative that will keep engineers from falling too far behind. "Current travel restrictions are restricting the flow of information about state-of-the-art developments, which may in turn slow down the rate at which they are incorporated into new process integration schemes," said Wolf.

Briefs...

Matheson Tri-Gas expands facility—*Matheson Tri-Gas, Parsippany, NJ, has completed the expansion of its Chonan, Korea, facility. The facility is operated by MGPK, a wholly owned subsidiary of Matheson. The overall storage space in the new facility has been increased by some 270%, and houses a dedicated space for storage of hydride and corrosive gases, a new lab, and new administrative office space.*

Multilink partners with Magma—*Multilink Technology Corp., Somerset, NJ, is collaborating with Magma Design Automation Inc., Salem, NH, on the design of next generation VLSI products using CMOS technologies at 0.13µm and below. The companies will combine Multilink's systems knowledge and design capabilities with Magma's physical design technology to develop flows and techniques that meet time to market demands and accelerate the production of VLSI products for the communications market.*

Mentor forms partnership with TransEDA—*Mentor Graphics Corp., Wilsonville, OR, has signed a partnership agreement with TransEDA, a provider of verification solutions for electronic designs, which provides Mentor Consulting with access to TransEDA's coverage analysis and HDL checking tools. The agreement allows Mentor's consultants to build on their expertise and develop and test new flows and methodologies that are deployed for its customers.*

Briefs...

BOC Edwards to acquire Semco—*BOC Edwards, Wilmington, MA, has reached an agreement to acquire the business of Semco Corp., Livermore, CA. Semco will be integrated into BOC Edwards' chemical management business. The consideration will be payable in cash over five years, and the value of assets acquired is some $3 million. In addition, BOC Edwards will assume $4 million in debt.*

ESI to partner with OptiViz—*Electro Scientific Industries Inc. (ESI), Portland, OR, has developed a new IC package inspection system in a strategic partnership with OptiViz Technology Inc. The system, according to the companies, will perform high-speed, 3D inspection of ball grid arrays, chip-scale packages, and other bumped ICs handled in trays.*

Cadence enters JV—*Cadence Design Systems Inc., San Jose, CA, has entered a joint venture to establish a software institute in Beijing, China, which will train postgraduate level engineers in electronic design. The JV is between Cadence Design Systems Asia Ltd. and Beijing Zhongguancun Software Education Co. Ltd. Cadence will provide software and hardware for running the software; a curriculum; and application engineers to help train the students. Beijing Zhongguancun Software Education Investments Co. Ltd., which is composed of several Beijing-based investment companies, will provide land for the campus, buildings and facilities, and operating funds for the institute's first year.*

RECOVERY: *continued from page 1*

ing inventories back up in line with being able to keep manufacturing lines running, could bring a very good year for the semiconductor industry."

Semico Research Senior VP Sherry Garber argued that computer demand would recover in the second half, noting that when companies laid off employees this time around they sold off their computers too, and now would have to buy new ones for new employees. And it's about time to replace the last round of corporate PCs bought back in 1999, for year 2000 upgrades, given the typical three-year replacement cycle. Intel's new DDR boards and Microsoft XP should help demand, as well.

"There's a pick up in desk-top sales," says Feldhan. "It's single digit, but it is growth, and they have a richer bill of materials than last year."

Semico's optimistic 20% growth forecast was also based on the big upturn it started to see last fall in its consulting business as companies started planning, and on a strong positive showing by its Inflection Point Index — a first-derivative analysis of inventory information, OEM market information, and monthly semiconductor sales. The leading indicator went positive last winter, then after a slight pullback early this year was strongly up in March, about as positive as it has been since mid-1999. The company developed the index only about six months ago after SIA dropped its bookings numbers, but says the indicator did a good job of forecasting market turns when backcast over the last 25 years.

There's some concern about demand being driven by speculation from distributors, especially on high volume products like those made by ON Semiconductor.

"They like to stock up on our high volume products when they believe there's an upturn," says George. "And they're usually right."

But so far at least there's no problem with double booking, since there's still enough available capacity that lead times haven't stretched out.—*P.D.*

FAB UPDATE: *continued from page 1*

The Taiwan foundry also says it is shipping multiple 130nm products now and will be ready for 90nm production later this year, with a growing group of partners.

"0.13 is here, it's real, and it's coming like a freight train," says Ed Ross, president of TSMC North America.

He says TSMC has over 12,000 wafers in line right now, with 38 fully functional devices, including MPUs, SRAMs, FPGAs, and communications chips, delivered to customers, another 10 in production or risk production stage, and 65 additional customer tape outs. Next push is 90nm for systems on a chip, and there TSMC built first working silicon in 1Q this year, a 90nm 4M DRAM, and aims to have both 90nm core logic and mixed signal ready for risk production on 200mm wafers in 3Q02, on 300mm in 1Q03, using common design rules, electrical parameters and transistor characteristics with multiple IDMs, fabless design houses, and IP and EDA suppliers. Besides the deal with STMicroelectronics, Philips, and Motorola, Ross says, "You'll hear other announcements going forward."

UMC to ramp Fab 12A by year-end

UMC, which announced plans to double its capex to $1.6 billion last week, plans to ramp its 300mm Tainan Fab 12A to more than 10,000 300mm wafers/month by the end of the year — that's some 100,000 200mm equivalent wafers. Its $3.6 billion 300mm UMCi Fab in Singapore, now under construction, will start pilot production in 2Q03, at 0.13µm. The joint 300mm venture with AMD in Singapore is slated for mid-2005.

UMC also aims for a new generation every two years, piloting 0.13 now, 90nm in 2003, 65nm in 2005. It expects to ramp up 0.13 production to more than 10,000 wafers/month by the end of the year. So far it reports 14 products for eight customers, ranging from a server CPU to a copy machine image processor, some with "decent yields."

"We had some learning," says J.J. Lee, VP of platform deployment, "but now we have some successful stories to report from customers."

UMC expects its first partner/early adopter 90nm product tape outs in 3Q02 and pilot runs in 4Q02, with qualification for pilot logic production 1Q03.

AMD looks to up capex

Projected capital spending on AMD's presentation slides was around $850 million, up about 20% from 2001. But Jim Duran, VP of technology development and manufacturing, noted the company "now plans to spend a little more than this."

AMD will complete the full build-out of its Fab 30 in Dresden, and aims to complete transitioning to 130nm by the end of the year. Duran notes that the automated Dresden fab can tell where every wafer is, select the recipe for that wafer, and reconfigure the process in only four hours. It will make 35 million microprocessors this year.

Meanwhile, AMD is converting Fab 25 in Austin, TX, from microprocessors to flash memory, building capacity for 500,000 wafers/year. It started production shipments last week.

Though Duran says "we've never bought a wafer from a foundry yet," the company has expanded its foundry agreement to acquire capacity for 130nm and 90nm production to supplement Fab 30. AMD aims to start producing its 90nm generation at Dresden in 2003, on 200mm SOI wafers. The task of developing 65nm 300mm technology will be shared with UMC/Taiwan, and produced at the UMC joint venture fab in Singapore starting in 2005.

Moto aims at 300mm for 2004

Motorola will do its 90nm development and pilot manufacturing at STMicroelectronics Crolles 2 fab under its new alliance with ST and Philips. The facility now under construction in Crolles, France, will soon start the first phase of ordering equipment, aiming at processing first silicon by the end of the year. A significant amount of pilot manufacturing capacity will be added, to be shared among the three partners, and each will be able to transfer the technologies developed to its own internal fabs. Decisions regarding future equipment selections will be made jointly by the partners. But Sean Hunkler, Motorola VP and director, die manufacturing, semiconductor products sector, says, "Suppliers should talk to ST, which owns the Crolles facility, since the structure of Crolles 2 is not defined yet." Motorola's latest fab chart shows its first 300mm fab in 2004.

With its new asset-light strategy, Motorola plans to focus on advanced and specialty technologies at fewer high volume facilities, and to outsource a significant portion of its baseline manufacturing. Wafer capacity is down to the equivalent of some 42,000 200mm wafers/week, and is expected to be reduced to 40,000 next year.

ST: No current plans for 300mm

STMicroelectronics is ramping its 200mm plant in Singapore, and constructing the new pilot plant at Crolles and one in Catania, Sicily. While those two facilities are ready for 300mm, Fabio Gualandris, memory product group VP, says, "We have no plan to put in any. We're developing 0.10 on 200mm and have no plan now for 300mm. We have concern about what is the cost of 0.10 on 300mm."

Micron focuses on shrinks, invests $250M in R&D for 2002

Micron Technology's Trung Doan, VP of process development, noted Micron, too, was far more interested in shrinks — running about a generation a year — than in 300mm. The company will invest about $1 billion this year, though that includes its $250 million in R&D.

"We can buy capacity very reasonably in the marketplace," notes Doan.

He said the majority of Micron's fabs were at 0.15, while 0.13 was in production but in low volumes of 2,000 to 3,000 wafers/week, and 0.11 was in pilot production now, aiming at full production late this year, as the company tries to keep moving all its fabs down the generation chain. The company wants to get software help in data mining. And it is really upset by different regional pricing, and spare parts prices that are not competitive with those from second sources.

ON Semi looks for supply chain in China

ON Semiconductor wants used equipment and local supply and support of materials at its planned expansion off the beaten track in inland China and central Europe. It plans to begin construction next year of a new fab in Leshan, China, to start production in 2004, and to build out an integrated factory for the Chinese market. William George, senior VP and chief manufacturing officer, says people tell him, "if you can make semiconductors there you can make them anywhere."

Wages in this out-of-the-way part of China are half what they are on the coast. Also in the works: A new 150mm analog fab to run 15,000 wafers/week in Rosnov, Czech Republic, where the company has acquired the old Czech National Semiconductor Co.'s plants.

The company is looking for used tools.

"I can't remember the last time I bought a new piece of fab gear," says George.

But the high-volume plants spend more on materials than equipment, and George hopes he can find some suppliers to help build the infrastructure in these areas.

"We need to source locally to keep costs down or we lose our advantage," he says. "We hope to find suppliers to help."

LSI trends toward outsourcing

LSI Logic will cut capital spending to less than $100 million this year, as it goes to a 30% outsourcing strategy and focuses on generating IP in the US.—*P.D.*

Briefs...

BOC Edwards opens new facility—*BOC Edwards, Wilmington, MA, is set to move its Minnesota-based chemical management business to a new facility in Chanhassen, MN, this month. The new facility, designed to support the company's chemical management operations, will include a new R&D lab, Class 10,000 cleanrooms, customer training labs, and a dedicated software and controls lab. The R&D lab space will increase by 50% over its current size, and will include facilities to support customer application projects, and equipment development and materials analysis.*

AMD vet appointed to state government—*Martin Gillo, director of HR for AMD in Europe, has been appointed to a cabinet position in the state government of Saxony, Germany. Gillo will serve as the state's new secretary of economic affairs and labor. Gillo has been with AMD for over 20 years.*

VJ Electronix opens facility—*VJ Electronix, Bohemia, NY, a division of V.J. Technologies Inc., and manufacturer of X-ray inspection systems, has opened a new facility in Manteca, CA, that will serve as a West Coast service and support center for local installations. The facility has two full-time engineers.*

LogicVision names AMOS as distributor—*LogicVision Inc., San Jose, CA, has named AMOS Technologies Ltd., Ra'anana, Israel, as its major distributor for LogicVision products in Israel. Terms of the agreement were not disclosed.*

Financial Digest

AMD
Sunnyvale, CA
1Q02 ended March 31

	This Year	Last Year
Revenue	$902.1M	$1.2B
Income	($9.2M)	$124.8M
EPS	($0.03)	$0.37

AMD sold eight million PC processors in 1Q02. Total PC processor sales of $684 million in 1Q grew by 3% compared to $661 million in the like period of 2001. Processor sales declined by 3% from the $703 million reported in 4Q01. Sales of memory products continued to be weak, totaling $160 million, compared to $411 million in 1Q01.

ATMI Inc.
Danbury, CT
1Q02 ended March 31

	This Year	Last Year
Revenue	$48.4M	$77.3M
Income	($2.7M)	$3M
EPS	($0.09)	$0.10

"New product sales, primarily to advanced interconnect applications, exceeded our expectations in the first quarter, for both systems and materials," said Doug Neugold, president. Dan Sharkey, CFO added, "The materials segment grew 29% sequentially to $29.2 million, driven by liquid materials and associated delivery equipment, and strong SDS sales. Our technologies segment revenues expanded 2% sequentially to $19.2 million."

Cadence Design Systems Inc.
San Jose, CA
1Q02 ended March 30

	This Year	Last Year
Revenue	$344.7M	$344.7M
Income	$21.3M	$3.8M
EPS	$0.08	$0.01

Total services revenue for 1Q02 declined 16% to $43 million. The company continued to show strong results in its custom IC analog/mixed-signal market, triggered by the rapid growth of semiconductors with voice, data, and multimedia computing, and communications capabilities. In the quarter, 19 out of Cadence's top 20 customers purchased custom IC solutions.

Conexant Systems Inc.
Newport Beach, CA
2Q02 ended March 29

	This Year	Last Year
Revenue	$241M	$251M
Income	($200.7M)	($262M)
EPS	($0.78)	($1.08)

"We delivered sequential growth in all three businesses in a period that is traditionally weak for our addressed markets," said Dwight Decker, chairman and CEO. "We are pleased that our wireless communications and broadband access businesses grew for a third consecutive quarter."

Cypress Semiconductor Corp.
San Jose, CA
1Q02 ended March 31

	This Year	Last Year
Revenue	$193.2M	$262.3M
Income	($39.8M)	$10.5M
EPS	($0.33)	$0.08

"Our bookings of $201.5 million resulted in a book-to-bill of 1.04, providing us with a modest backlog that has been absent in recent quarters," said T.J. Rodgers, CEO. "The data communications market is beginning to improve after one year of dormancy, the wireless market remains active at a reasonably high level and the consumer market continues to be strong. We are therefore growing mildly even though our largest market segment, data communications, is just starting to recover."

Keithley Instruments Inc.
Cleveland, OH
2Q02 ended March 31

	This Year	Last Year
Revenue	$22M	$43.2M
Income	($1.3M)	$5.1M
EPS	($0.08)	$0.31

Orders of $22.7 million for 2Q02 increased 13% from 1Q02, resulting from higher orders from Keithley's semiconductor and telecommunications industry customers. Geographically, orders were down 46% in the US, 38% in Europe, and down 2% in the Pacific Basin compared to 2Q01. Keithley opened a sales and support office in Japan on April 1.

KLA-Tencor Corp.
San Jose, CA
3Q02 ended March 31

	This Year	Last Year
Revenue	$357.1M	$617.6M
Income	$34.1M	$136.3M
EPS	$0.17	$0.71

Bookings for the quarter improved over the previous quarter, with the majority of the orders coming from Taiwan. US-based orders improved quarter-to-quarter, while Japan-based orders were below its historical share. KLA-Tencor ended the quarter with over six months of backlog at current shipping levels, with a book-to-ship ratio that exceed 1:1 for the first time in five quarters.

Kulicke & Soffa Industries Inc.
Willow Grove, PA
2Q02 ended March 31

	This Year	Last Year
Revenue	$106.9M	$149.4M
Income	($43.6M)	($11.7M)
EPS	($0.89)	($0.24)

Net bookings for 2Q02 totaled $126 million, up 27% compared to the $99 million in 1Q02. Backlog increased by 43% from $44 million at the end of 1Q01 to $63 million at the end of 2Q02. According to Chairman and CEO C. Scott Kulicke, K&S' China initiative is underway, and the company has begun to ship its newest automatic ball bonder this month.

Financial Digest

	This Year	Last Year
Linear Technology Corp.		
Milpitas, CA		
3Q02 ended March 31		
Revenue	$130.2M	$282M
Income	$51.5M	$125.7M
EPS	$0.16	$0.38

"Sales and profits grew sequentially 7 and 12% respectively over the previous quarter," said Robert Swanson, chairman and CEO. "Bookings, which exceeded sales, grew in all major geographical and major end markets. In January we discontinued production in our oldest wafer fabrication plant. Looking forward, we have seen a broad-based increase in our bookings activity throughout the quarter."

	This Year	Last Year
Nanometrics Inc.		
Milpitas, CA		
1Q02 ended March 31		
Revenue	$8M	$14.4M
Income	($1.5M)	$1.6M
EPS	($0.13)	$0.14

Nanometrics spent $3.4 million on R&D during the quarter. The company said that the reduction in first quarter revenues was due to weaker demand for semiconductor process control equipment, particularly in the US and Pacific Rim countries.

DATAQUEST: *continued from page 3*

have tended to dilute the market. This will change as the market matures."

Led by ARM and MIPS Technology, microprocessor blocks dominated worldwide IP revenue, reaching $292 million in 2001. Bus interface blocks such as PCI, USB, and IEEE 1394 have proven to be popular functions for third-party IP providers because of the ease of verifying a standard function, Dataquest said. Bus interface is the second largest category, reaching $140 million.

Dataquest analysts said business models for IP vendors are an important factor in the market. There is a large amount of experimentation taking place, but this is to be expected in view of the relative newness of the market.

"Throughout this experimentation, vendors need to find out where the value is. Far too little attention is given to the value proposition in IP transactions," said Tully. "Value can lie in unique technology, applications expertise, support services, or simply making it easy for customers to evaluate and buy the product. Wherever it lies, this must be at the core of a successful business model."

Gartner Dataquest defines a semiconductor IP block as a pre-designed function to be implemented in a semiconductor device such as an ASIC, ASSP, or PLD.—*R.R.*

Top 10 worldwide semiconductor IP vendors by revenue (US$M)

Company	FY01 Revenue	FY01 Market Share (%)	FY00 Revenue	FY00 Market Share (%)	FY00–FY01 Growth (%)
ARM	$179.0	20.1	$130.1	18.2	37.6
RAMBUS	107.3	12.0	95.1	13.3	12.8
MIPS Technologies	70.2	7.9	88.5	12.4	(20.7)
Synopsys	45.0	5.0	33.8	4.7	33.0
TTP Com	34.9	3.9	24.1	3.4	44.9
Virage Logic	34.8	3.9	22.8	3.2	52.9
Mentor Graphics	30.5	3.4	34.1	4.8	(10.5)
Parthus Technologies	30.0	3.4	16.1	2.3	86.8
Artisan	27.8	3.1	20.8	2.9	33.6
DSP Group	26.6	3.0	25.1	3.5	6.0
Others	305.5	34.3	223.0	31.3	37.0
Total market	**$891.6**	**100.0%**	**$713.5**	**100.0%**	**25.0%**

WaferNews source: Gartner Dataquest

Briefs...

Dyneon appoints two managers—*Dyneon, Oakdale, MN, a 3M company, has appointed two new regional sales managers within its fluoroelastomers business unit. Maritherese Smith will oversee the West and Northeast regions, while John Reese will oversee the Midwest and Southeast areas.*

Mattson completes private placement—*Mattson Technology Inc., Fremont, CA, has completed the closing of its private placement transaction in the amount of $45.6 million. The company has issued some 7.4 million shares of its common stock at a price of $6.15 per share, and has received cash proceeds of $37.5 million and reduced its outstanding promissory notes to STEAG Electronic Systems AG by $8.1 million.*

CoorsTek files for offering—*CoorsTek Inc., Golden, CO, a designer and manufacturer of components and integrated assemblies, has filed with the SEC a registration statement for a follow-on public offering of 2.5 million shares of its common stock, plus an additional 375,000 shares subject to the underwriter's overallotment option.*

Ellipsiz appoints director—*The Ellipsiz Group, Singapore, a provider of test solutions to the semiconductor industry, has appointed Chew Kok Kim, previously the country manager of Singapore and Indonesia at ESEC Asia Pacific, to the position of director of engineering solutions — test business unit.*

Briefs...

New president for MRL—*MRL Industries Inc., Sonora, CA, a manufacturer and re-manufacturer of thermal processing systems and heating elements, has named Pontus Nilsson to the position of president. Nilsson succeeds Bill McEntire, the founder of MRL, who has retired.*

K&S names president—*Kulicke & Soffa Industries, Willow Grove, PA, has promoted Alexander Oscilowski, senior VP, to the position of president, with responsibility for managing the company's global operations. In this newly created position, Oscilowski will report to C. Scott Kulicke, chairman and CEO. Oscilowski joined K&S in 1999.*

Nova Measuring names president—*Nova Measuring Instruments K.K., Tokyo, Japan, has appointed Makoto Hokazono as president and representative director to the board of directors of Nova Measuring Instruments K.K., a wholly owned subsidiary of Nova Measuring Instruments Ltd., Rehovoth, Israel. Prior to joining Nova, Hokazono was with Semitool Japan.*

inSilicon appoints CEO—*inSilicon Corp., San Jose, CA, a provider of connectivity semiconductor IP, has appointed Barry Hoberman as president and CEO. Hoberman, who has been with inSilicon since its inception, has performed as interim CEO for the past two months.*

Venture Capital Corner

True to form, chip testing company files for IPO

FormFactor Inc., Livermore, CA, a maker of probe cards for semiconductor testing tools, has filed a Form S-1 registration statement with the SEC for a proposed initial public offering of its common stock.

The filing provides for an offering of up to $100 million of common stock. Terms of the IPO, such as number of shares offered and their estimated price are not yet available.

The company's products are based on its proprietary MicroSpring interconnect technology, which includes resilient spring-like contact elements. The MicroSpring technology enables FormFactor to produce wafer probe cards for test applications that require reliability, speed, precision, and signal integrity.

Morgan Stanley will serve as lead managing underwriter of the offering, with Lehman Brothers, Banc of America Securities LLC, and Thomas Weisel Partners LLC serving as co-managing underwriters.

FormFactor's board of directors include Joseph Bronson, exec. VP of Applied Materials; William Davidow, general partner of Mohr, Davidow Ventures, chairman of FormFactor's board of directors; G. Carl Everett Jr., founder GCE Ventures, former senior VP, personal systems group of Dell Computer Corp.; William Harding, managing member of Morgan Stanley Venture Partners II LLC; Igor Khandros, CEO and founder of FormFactor; James Prestridge, consultant and former board member and vice chairman and exec. VP of Teradyne.—*R.R.*

Zeevo

Location: Santa Clara, CA
Founders: Anil Aggarwal from VLSI, Compass; Louis Pandula from Cadence, VLSI
Founded: 1999
Funding awarded: $3 million
Funding from: Transamerica Technology Finance, GATX
Product lines: Wireless ICs for the Bluetooth standard
Market Strategy: Highly integrated solution which to the user looks like an easy-to-use digital IC
Geographic target market: Not geographically distinct
Target date for IPO: Not disclosed
Number of employees: 71
Customers: Seven customers — names not disclosed pending release of products
Competitors: Cambridge Silicon Radio, Silicon Wave
URL: www.zeevo.com
Address: 2500 Condensa St. Santa Clara, CA 95051
Phone: 408-982-8000

Sierra Logic

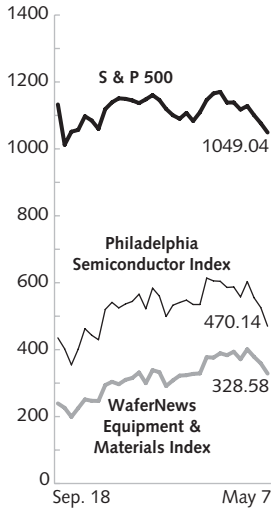
Location: Roseville, CA
Founders: Bob Whitson, Bryan Cowger, Joe Steinmetz, Margie Evashenk from HP and Agilent Technologies
Founded: June 2001
Funding awarded: $5.25M
Funding from: Quantum Technology Ventures, TPG Ventures
Product lines: Storage semiconductors
Market Strategy: To attempt to address the needs of all storage OEMs in the mid-range and high-end storage spaces
Geographic target market: N/A
Target date for IPO: N/A
Number of employees: 20+
Customers: Not disclosed
Competitors: Not disclosed
URL: www.sierralogic.com
Address: 2021 Opportunity Dr. Roseville, CA 95678
Phone: 916-772-1234

The WaferNews Fab 50

	Close 05/07/02	Close 04/30/02	Net Change	% Change Week	% Change YTD	P/E Ratio	52-Week High	52-Week Low	Market Cap ($M)
Semiconductor Equipment									
ADE Corp	12.58	13.10	-0.52	-3.96	25.80	—	20.00	8.40	172
Applied Materials	22.32	24.32	-2.00	-8.22	-44.34	131	29.24	13.29	36560
ASM International	21.23	23.00	-1.77	-7.70	8.82	193	28.92	9.35	1042
ASM Lithography	19.65	22.33	-2.68	-12.00	15.25	63	27.95	9.51	9098
Asyst	14.44	16.40	-1.96	-11.95	13.17	—	23.70	7.66	515
Axcelis Technologies	13.20	14.40	-1.20	-8.33	2.40	—	18.60	8.55	1293
Electroglas	16.50	16.81	-0.31	-1.84	11.71	—	18.35	11.50	348
FEI Company	24.90	26.43	-1.53	-5.79	-20.98	29	43.40	17.75	803
FSI International	10.45	11.93	-1.48	-12.41	13.34	—	16.25	6.71	274
Genus	4.10	4.05	0.05	1.23	68.72	—	7.54	1.52	91
KLA-Tencor	53.99	58.97	-4.98	-8.44	8.94	35	70.58	28.61	10099
Kulicke & Soffa	16.36	18.14	-1.78	-9.81	-4.61	—	21.67	8.16	804
Lam Research	23.29	25.66	-2.37	-9.24	0.30	—	33.76	14.73	2931
Mattson	7.76	8.58	-0.82	-9.56	-11.92	—	19.50	3.06	293
Metron Technology	8.90	9.19	-0.29	-3.16	27.13	178	11.10	6.00	115
Micro Component Technology	3.17	3.40	-0.23	-6.76	7.46	—	4.47	1.46	45
Nanometrics	18.36	18.93	-0.57	-3.01	-5.36	—	36.66	13.00	216
Novellus	45.66	47.40	-1.74	-3.67	15.74	101	58.70	25.37	6619
PRI Automation	16.93	18.59	-1.66	-8.93	-17.21	—	27.00	8.75	435
Rudolph Technologies	25.15	30.50	-5.35	-17.54	-26.72	70	52.45	15.52	406
Semitool (H)	13.65	14.14	-0.49	-3.47	18.90	—	15.20	7.50	388
Speedfam-IPEC	2.94	2.80	0.14	4.96	-1.38	—	6.10	0.91	90
Tegal	1.03	1.19	-0.16	-13.45	-23.13	—	3.45	1.00	15
Therma-Wave	12.80	14.14	-1.34	-9.48	-14.21	66	19.20	9.00	369
Trikon Technologies	12.90	14.04	-1.14	-8.12	9.79	14	16.72	6.96	166
Ultratech Stepper	14.70	17.07	-2.37	-13.88	-11.02	—	26.56	10.80	331
Varian Semi Equipment Assoc.	42.70	46.72	-4.02	-8.60	23.45	305	50.11	22.02	1400
Veeco	28.07	29.63	-1.56	-5.28	-22.14	—	57.50	19.90	815
Semiconductor Equipment Subsystems									
Advanced Energy Industries	31.19	34.80	-3.61	-10.37	17.08	—	45.06	15.40	995
Brooks Automation	32.52	35.65	-3.13	-8.78	-20.04	—	59.16	24.78	649
Cymer	42.35	47.27	-4.92	-10.41	58.44	385	53.44	14.15	1420
MKS	32.07	33.89	-1.82	-5.37	18.65	—	38.94	15.17	1605
Numerical Technologies (L)	10.15	13.04	-2.89	-22.16	-71.16	—	39.00	10.15	341
Semiconductor Materials									
ATMI	27.35	30.50	-3.15	-10.33	14.68	—	37.10	14.50	834
AXT	9.50	11.60	-2.10	-18.10	-34.16	—	41.65	8.55	213
Cabot Microelectronics	44.17	48.90	-4.73	-9.67	-44.26	32	87.46	42.40	1067
DuPont Photomasks	35.76	38.98	-3.22	-8.26	-17.70	—	59.13	22.60	639
Entegris Inc.	15.00	15.75	-0.75	-4.76	36.86	—	19.99	6.60	1054
Ibis Technology	8.09	9.43	-1.34	-14.21	-45.60	—	18.00	3.15	68
Isonics Corp.	1.22	1.25	-0.03	-2.20	12.96	—	1.93	0.61	13
MEMC	7.82	8.10	-0.28	-3.46	120.28	—	11.50	1.05	544
Photronics	30.58	32.95	-2.37	-7.19	-2.46	—	35.57	16.85	929
Chipmakers									
AMD	10.64	11.18	-0.54	-4.83	-32.91	—	34.65	7.69	3631
IBM (L)	76.50	83.76	-7.26	-8.67	-36.76	19	126.39	76.00	131346
Intel	26.15	28.61	-2.46	-8.60	-16.85	101	36.78	18.96	175283
LSI Logic	10.75	12.85	-2.10	-16.34	-31.88	—	25.05	9.70	3969
Micron	23.25	23.70	-0.45	-1.90	-25.00	—	44.99	16.39	13986
Motorola	14.69	15.40	-0.71	-4.61	-2.20	—	19.49	10.50	33352
National Semiconductor	28.16	31.52	-3.36	-10.66	-8.54	—	37.30	19.70	5047
Texas Instruments	27.51	30.93	-3.42	-11.06	-1.75	—	42.91	20.10	47713

Market Diary

Week ending April 30, 2002



Advances 2

Declines 48

Unchanged 0

New Highs 1

New Lows. 2

Largest Dollar Gain:. **$0.14**
Speedfam-IPEC

Largest Dollar Loser: . . . . . **($7.26)**
IBM (L)

Largest % Gain:. **4.96%**
Speedfam-IPEC

Largest % Loser:. . . . . **-22.16%**
Numerical Technologies (L)

(H) = Company hit a new 52-Week High in Period (L) = Company hit a new 52-Week Low in Period

Data for the *WaferNews* Fab 50 and *WaferNews* Equipment & Materials Index is copyrighted and provided by CNET Investor (investor.cnet.com), Boulder, CO.

Briefs...

Mykrolis names VP— *Mykrolis Corp., Bedford, MA, has appointed Gerry MacKay to the position of VP of marketing and sales. MacKay joins Mykrolis from Millipore Corp.*

ESEC elects chairman— *ESEC, Cham, Switzerland, has elected Heinz Kundert as its chairman. Kundert is assuming the position of chairman from Willy Kissling, who will devote his efforts to the board chairmanship of ESEC's majority shareholder, Unaxis. Additionally, Jürgen Knorr was named the new vice chairman of ESEC.*

USDC elects chairman— *The US Display Consortium (USDC) has elected Dalen Keys as chairman of its governing board. Keys, CTO of DuPont Displays, succeeds Jeffrey Buchanan, exec. VP and CFO of Three-Five Systems Inc. The chairman appointment is for a two-year term. The USDC also reappointed Michael Ciesinski as president and CEO, and M. Robert Pinnel as CTO.*

New CFO for Cirrus Logic— *Cirrus Logic, Austin, TX, has named Steven Overly senior VP and CFO. Overly has been acting CFO since October 2001. In addition to his duties as CFO, Overly will remain the company's general counsel and will continue to oversee HR.*

2002: Nanotech odyssey begins in Europe

European NanoBusiness Assoc. opens with much public interest

The European NanoBusiness Association was launched recently in Brussels, Belgium, with the goal of providing a neutral platform upon which the business, academic, and financial communities can come together for the benefit of Europe's nanotechnology initiative.

"In order to get nanotechnology out of the lab and into industry and have it being used," explained association Executive Director Tim Harper, "we have to bridge the chasm between science and business."

Harper told *WaferNews* that technology in Europe has often been a problem because while there is an "excellent research base on an academic level, turning that research into world-class companies has been better in the US and Japan."

The aim of the association is to bring together all parties interested in nanotechnology and to help plug the gaps in expertise.

Specifically, the European NanoBusiness Association intends to:

- Discuss and promote the development of a dynamic nanotechnology industry;
- Build a common forum in which to rapidly share and disseminate well-researched and realistic information for its members and for public education;
- Promote the development of promising technology arenas;
- Connect its members with the local and global nanotechnology communities; and
- Monitor and benchmark Europe's competitive position in relation to the building and commercialization of nanotechnology.

"One of the first things we're doing," Harper remarked, "is setting up meetings across Europe with the idea of setting up a grass roots organization."

Harper said that the meetings would bring together local government, financial organizations, and industry in order to find out exactly what nanotechnology is, and what it means. "Once we bring these people together, hopefully they can find synergies themselves at a local level."

The association is non-profit and completely neutral, explained Harper, a major plus because "the nanotech industry is so diverse and cuts across so many vertical markets, you really need to bring people together in a neutral forum."

The association does not make commission on any deals created, and does not charge for published reports or studies. Members need only pay a membership fee for admission.

Aside from the informal meetings, Harper said that every six months there would be a benchmarking exercise, which would bring together businesses, science, and governments from all over Europe and compare how the region is doing compared to the rest of the world. "We want to identify what we're doing well, identify best practices, and see what we're not doing very well."

For its third action point, the European NanoBusiness Association plans to host an annual conference/trade show that would bring together organizations and people. Harper said he hopes that the meetings, shows, and benchmarking exercises will identify strategies that work, and bring nanotechnology out of research and development and into reality.

Harper commented that a large obstacle facing Europe's nanotech industry is that "one can see a huge difference in attitude in the commercialization of nanotech from wild enthusiasm to 'couldn't care less.'"

He noted that Europe's major economies like Britain, France, Germany, and Switzerland, for example, have a strong technology component and have strong interest in nanotechnology. However, Harper went on to remark that some other countries with less technology aren't "quite on the ball yet."

The association is committed to explaining to the public that there is a strong need for nanotechnology — the public including everyone "from the man on the street to prime ministers and presidents."

He noted that when people think of nanotechnology, they often think of mini submarines in the bloodstream or nano-robots.

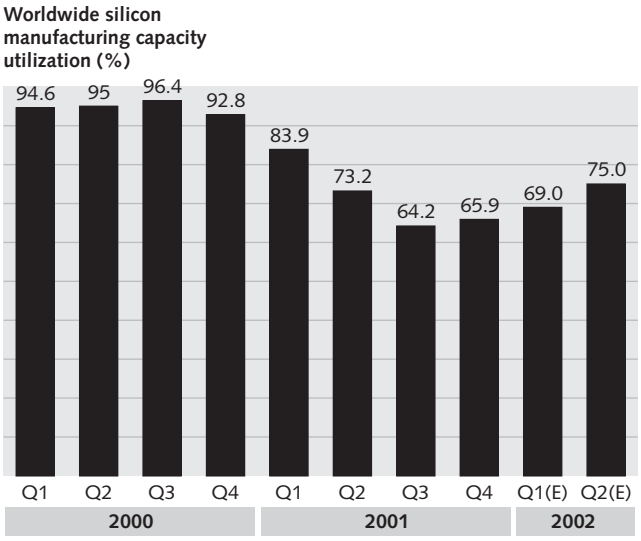
"That is science fiction, and it's important to know the difference," he commented. "You can't build business on nano-robots. Some of those sexy things can happen, but that's not what nanotechnology is."

Nanotechnology can be found today in pants, trucks, and even ski wax, Harper said. "It's not something that is five, 10, or 50 years in the future. It's now."—*R.R.*

Capacity utilization heads steadily back up, but US lags

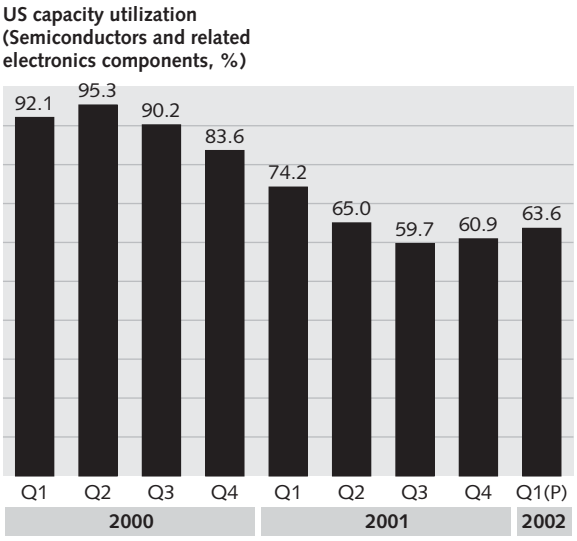
Worldwide semiconductor capacity utilization looks to be heading back up to 70 to 75% so far this year, according to SICAS, thanks both to increasing demand and to plant closures that have reduced the total capacity available. But in yet another indication of how the industry is moving to Asia and to foundries, US semiconductor fab utilization tracked by the Federal Reserve — a reasonable proxy for the IDMs — is back up only to about 64%. Capacity at the leading edge is, of course, much tighter everywhere.—*P.D.*

Worldwide capacity utilization heads up strongly



WaferNews Source: SICAS, SEMI SBC 2002

US utilization up too, though rate remains lower



WaferNews Source: Federal Reserve

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